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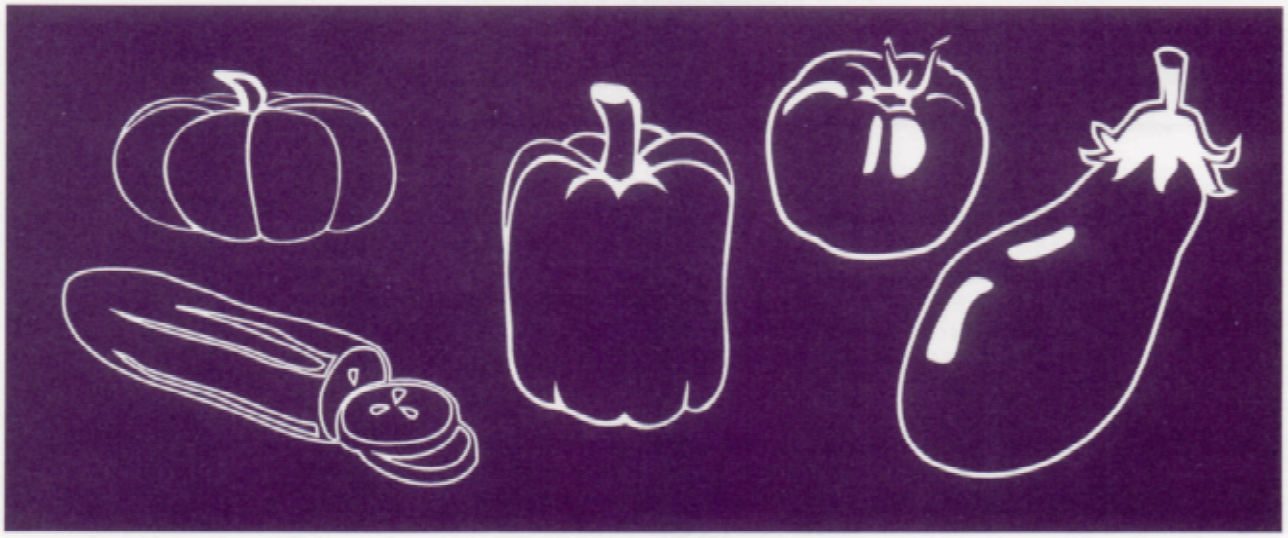
Competition in the U.S. Winter Fresh Vegetable Industry

John J. VanSickle
Emil Belibasis
Dan Cantliffe
Gary Thompson
Norm Oebker



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Abstract

Florida and Mexico compete vigorously in the U.S. winter market for several vegetables. Florida gained in competitive advantage during 1985/86-1990/91 primarily because of gains in pricing advantage. The cost of producing and marketing vegetables in select terminal markets shows that Florida's advantage increased for tomatoes produced in the Dade County and Palmetto-Ruskin production areas and for cucumbers and squash. Florida's advantage decreased for tomatoes produced in southwest Florida and for bell peppers and eggplant. U.S. import duties generally contribute to Mexico's high marketing costs, which offset the lower cost of producing vegetables in Mexico. Those cost advantages, however, lost significance because of lower gains in productivity caused by decreased investment in technology, higher costs of resources over which the Mexican Government had relinquished control, and lower labor productivity. NAFTA provides for the eventual removal of tariffs between the two countries. Tariffs are generally a small part of the total unit cost of production and marketing for these crops, ranging from 4 percent for squash to 14 percent for cucumbers.

Keywords: Fresh vegetables, cost of production, cost advantage, price advantage, net competitive advantage, Florida/Mexico competition.

The Authors

John J. VanSickle is a professor, food and resource economics, University of Florida; Emil Belibasis is a research associate, food and resource economics, University of Florida; Dan Cantliffe is a professor and chairman, horticultural sciences, University of Florida; Gary Thompson is an associate professor, agricultural economics, University of Arizona; and Norm Oebker is a professor, horticultural sciences, University of Arizona.

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Contents

Summary

Florida gained competitive advantage over Mexico in the U.S. winter fresh vegetable market between 1985/86 and 1990/91. Florida and the Mexican State of Sinaloa supply most fresh winter vegetables to U.S. consumers. Market shares indicate that Florida is the major supplier of these vegetables in eastern markets, except for cucumbers, and Sinaloa is the major supplier to western markets, except for green beans. Both Florida and Sinaloa compete in all markets to some degree. Because their production and marketing seasons are similar, Florida and Mexico are in direct competition during October through June. The most intense competition is during December through April when both areas are in full production, and these two producing areas account for over 90 percent of the U.S. market for several vegetables.

Florida producers held a competitive edge over Mexican producers for cucumbers, eggplant and squash, and for tomatoes produced in Dade County during 1990/91. Mexican producers in Sinaloa held an advantage for bell peppers and for tomatoes compared with those produced in southwest and west central Florida.

Florida gained in competitive advantage during 1985/86-1990/91 primarily because of gains in pricing advantage. The cost of producing and marketing vegetables in select terminal markets shows that Florida's advantage increased for tomatoes produced in the Dade County and Palmetto-Ruskin production areas and for cucumbers and squash. Florida's advantage decreased for tomatoes produced in southwest Florida and for bell peppers and eggplant. U.S. tariffs are generally small, ranging from 4 percent of the total unit cost of production and marketing for squash to 14 percent for cucumbers. NAFTA provides for the eventual removal of these tariffs and will thus lower Mexico's high marketing costs. These costs have offset the lower cost of producing vegetables in Mexico. Mexican producers had lower costs of production, but those advantages lost significance because of lower gains in productivity caused by decreased investment in technology, higher costs of resources over which the Mexican Government had relinquished control, and lower labor productivity.

Sinaloa holds a large advantage in growing and packing winter vegetables for the fresh winter market. However, transportation costs to the border and import and export fees significantly increased the costs of marketing Mexican produce in the United States. The expected decrease in marketing costs, including the removal of tariffs, could shift the competitive advantage to Mexican producers.

Adverse weather in Florida and the seasonal production pattern for Mexican vegetables have dulled the cost advantage Florida producers hold. Frequent freezes in the late 1980's gave Mexican growers extremely high prices for some of their produce. For example, Mexican growers earned an average of $21.49 per 25-pound equivalent for tomatoes in 1989/90 because of a freeze in Florida, while in Dade County, Florida, producers, on average, received less than $5.00.

Labor is the most expensive input in producing vegetables in both Florida and Sinaloa. Although U.S. labor rates rose during the late 1980's, Mexican labor costs rose more rapidly. Low labor productivity has increased the costs of producing vegetables in Mexico more than those in the United States. Recent economic reforms in Mexico have also increased other costs, especially for fertilizer and energy.

The authors used production and marketing costs and weighted average prices received to assess the competitive position of five winter fresh vegetables grown in Florida and Sinaloa. They used the cost and price advantages to measure the competitiveness of producing and marketing each of the vegetables in U.S. markets.

Competition in the U.S. Winter Fresh Vegetable Industry

John J. VanSickle, Emil Belibasis, Dan Cantliffe,
Gary Thompson, and Norm Oebker

Introduction

Florida and the Mexican State of Sinaloa supply most winter fresh vegetables to U.S. consumers. Because their production and marketing seasons are similar, Florida and Mexico are in direct competition during October through June. The most intense competition is during December through April when both areas are in full production and these two producing areas account for over 90 percent of the U.S. market for several vegetables.

Several analysts (Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez, 1986; Fliginger, Garett, Podany, and Powell, 1969; Simmons, Pearson, and Smith, 1976; and Zepp and Simmons, 1979) have assessed the competitive position of Florida and Mexico in the winter fresh vegetable market during the seasons of 1967/68, 1973/74, 1974/75, 1978/79, and 1984/85.

Fresh vegetable exports have been important to Mexico because they generate considerable foreign exchange and employment. The value of Mexican exports competing with U.S. production was $272 million for the 1990/91 production season (table 1). Tomato exports represented about 38 percent ($103 million) of this value.

The winter fresh market has also been important to Florida where the value of winter vegetable production competing with Mexico was $942 million in the 1990/91 season. Tomatoes accounted for roughly 60 percent ($576 million) of this value. Partly as a result of these facts, fresh vegetable trade in the U.S. market during the winter season has emerged as a critical factor in U.S.-Mexico relations (Bredahl, Schmitz, and Hillman, 1987). This competition also emerged as a sensitive factor in negotiations for a North American Free Trade Agreement (NAFTA) involving Mexico, the United States, and Canada.

Background

Competition in the winter fresh vegetable market has been a topic of interest to growers, shippers, and policymakers for many years. Concentrated in Sinaloa in northwest Mexico, the Mexican fresh vegetable industry initially developed soon after World War II with considerable U.S. investment and expertise often actively encouraged by the Mexican Government. Mexican production and exports were relatively minor until the mid-1950's. Production and exports continued to climb until 1973. Although tomatoes were the major commodity, this general trend existed for other major vegetables. Mexico increased its share of the U.S. market during that time (Bredahl, Hillman, Rothenberg, and Gutierrez, 1983; and U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing West Mexico Fruits and Vegetables*, various issues).

Several factors over this period helped this upward trend in Mexican exports. First, the ending of trade between Cuba and the United States in 1962 created an opportunity for Mexican growers. Cuba had been a major supplier of fresh vegetables in the winter market. Mexico helped to fill the shortfall created by the removal of Cuban vegetables from the market.

Second, the U.S. Bracero Program was terminated in 1964. This program allowed the large-scale use of cheap guest labor in the production of fresh vegetables in the United States. Ending the program reduced the availability of this low-cost labor (many illegal farm workers still were available to U.S. growers at low cost) and the competitive position of production in several States. Termination of the program enhanced the position of Mexican growers who still had access to low-cost labor.

Third, the flow of financial resources and technical expertise from the United States into Mexico was considerable.

This sustained expansion by Mexico into the U.S. winter fresh vegetable market and the subsequent loss of market share by Florida led many producers in Florida to seek protection through various channels

Table 1–Winter fresh vegetables: Production and value in Florida and Mexico

Season/vegetable	Florida		Mexico	
	Production	Value	Production	Value
	1,000 metric tons	*Million dollars*	*1,000 metric tons*	*Million dollars*
1983/84:				
Tomatoes	610	367	248	149
Others[1]	375	187	190	129
1990/91:				
Tomatoes	709	576	185	103
Others[1]	505	366	244	169

[1]Bell peppers, cucumbers, eggplant, squash, and snap beans.
Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues; and Florida Agricultural Statistics Service, various issues.

open to them. Regulations imposed by the marketing order for fresh tomatoes produced in Florida and imported during the regulated season were claimed by Mexican growers to be discriminatory toward their exports. Several trade and legal battles ensued during the 1970's and early 1980's (Bredahl, Hillman, Rothenberg, and Gutierrez, 1983).

During the 1980's, the Mexican Government adopted a set of export controls that had the effect of reducing its position in the U.S. market. Mexico became more of a swing supplier to the market, increasing exports during periods of Florida's frequent production shortfalls and diverting supplies to the increasing domestic market during periods of adequate supplies and lower prices.

During the 1980's, production of all the major vegetables increased in Florida, which regained its prominent market share in four of the main vegetables: tomatoes, eggplant, squash, and green beans. Mexican growers maintained their market share advantage in bell peppers and cucumbers. Significant factors influencing Florida's growth in market shares have included dramatic technological advances and significant increases in labor costs in Mexico compared with Florida. However, both areas have the potential to expand production and market share if economic conditions warrant the increased production.

Objectives

The objective of this study is to assess the general competitiveness of Florida and Mexico in the winter fresh vegetable industry in the following ways:

(1) Assess trends in trade of winter fresh vegetables to U.S. domestic markets from Florida and Mexico;

(2) Determine the cost competitive situation of Florida and Mexico in supplying fresh tomatoes, bell peppers, cucumbers, squash, and eggplant to U.S. domestic markets;

(3) Describe and assess technological changes in the production of vegetables in the two production areas; and

(4) Describe the changes in macroeconomic and policy variables that affect the cost-competitive positions of Florida and Mexico.

Competitive advantage between two areas in the production and marketing of a commodity depends on the net returns producers in each area receive from producing and marketing that commodity. As such, net competitive advantage depends on the costs of producing and marketing the commodity and the revenues received for marketing that commodity in the market of concern. Competitive advantage may occur because of lower costs of resources used in the production process, more efficient production practices, or higher prices received for the product in the marketplace.

Trade Flow Trends

Market shares, the percentage of a market served by a producer or producing area, serve as an indication of competition. The more competitive a producer or producing area is in production and marketing, the larger the market share it will acquire if entry or exit constraints are not present. This section analyzes market shares at shipping point and in wholesale markets for six primary vegetables: tomatoes, bell peppers, cucumbers, squash, eggplant, and green beans. These market shares provide evidence for assessing the competitiveness of Florida and Mexico in serving the U.S. winter fresh vegetable markets.

Historical Market Shares at Shipping Point

Changes in the competitive position of Florida and Mexico in the winter fresh vegetable market may be assessed by comparing changes in the volume of shipments and market shares from both areas. Changes in total volume of shipments indicate underlying changes in the demand and supply of the vegetable involved. Changes in market shares serve as indicators of underlying changes in competitive position of suppliers.

Tables 2 through 7 and figures 1 through 6 show market shares and the total domestic shipments over the 11 seasons of 1980/81 to 1990/91 for the six major vegetable crops studied for this report. The tables show that the total volume of shipments in the October to June market window increased substantially for all six commodities during 1980/81-1990/91. Total shipments of green beans were 56 percent higher in 1990/91 than in 1980/81. Total cucumber shipments were 22 percent higher, eggplant 15 percent higher, bell peppers 73 percent higher, squash 121 percent higher, and tomatoes 25 percent higher. The growth in volume generally took place prior to the 1987/88 production season, with the exceptions of squash, which continued to grow in volume through the 1988/89 season, and eggplant, which significantly increased in the 1990/91 season.

Average market shares during 1980/81-1990/91 in the October to June market window show that Florida dominated the market for green beans with an average market share of 68 percent, tomatoes with 53 percent, and eggplant with 53 percent. Florida controlled the largest market share for bell peppers with 43 percent. Mexico dominated the market for squash, with 55 percent of the market, and held the largest market share for cucumbers with 45 percent.

Green Beans

No real trends are evident in the market shares for Florida and Mexico in the green beans market (table 2). Florida's market share peaked in 1981/82 with a high of 77 percent, then declined and moved in a range between 63 and 69 percent over the final 6 years, ending at 65 percent in 1990/91. Mexico's market share peaked in 1985/86 with a high of 23 percent, but has generally ranged between 15 and 20 percent over the decade with no evident trend. Mexico ended 1990/91 with 19 percent of the market.

In the winter market of December to April when both Florida and Mexico are in full production, Florida's green beans market share ranged from 66 percent in 1985/86 to 78 percent in 1981/82, averaging 72 percent.

Table 2–Green beans: Market shares for Florida and Mexico and total shipments in the U.S. domestic market for three market windows

Season	October to June			December to April			May to June		
	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments
	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
1980/81	71.22	17.33	9,620	71.66	27.44	5,791	65.82	3.32	2,016
1981/82	77.24	15.55	10,085	78.06	21.11	7,262	65.06	1.85	1,351
1982/83	76.88	16.97	11,564	74.56	24.23	7,858	81.18	2.70	2,035
1983/84	73.21	17.74	12,421	73.65	24.85	8,528	58.84	2.13	2,155
1984/85	60.60	18.89	13,031	68.85	29.75	7,968	40.16	2.19	2,734
1985/86	63.20	22.91	13,616	65.57	33.21	9,148	52.76	1.77	2,485
1986/87	66.86	20.39	14,264	70.64	28.44	9,393	53.25	5.64	2,413
1987/88	64.78	19.27	15,125	71.36	28.03	9,882	51.27	3.22	2,949
1988/89	69.44	17.65	14,146	72.31	27.13	8,630	61.43	3.00	3,399
1989/90	63.99	19.89	15,066	69.00	30.52	9,188	47.62	2.75	3,385
1990/91	65.01	18.59	15,059	74.45	25.47	9,867	37.36	4.37	2,588
Average	67.82	18.81	13,099	71.71	27.43	8,501	54.34	3.03	2,509

Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Figure 1

Green beans: Market shares for Florida and Mexico

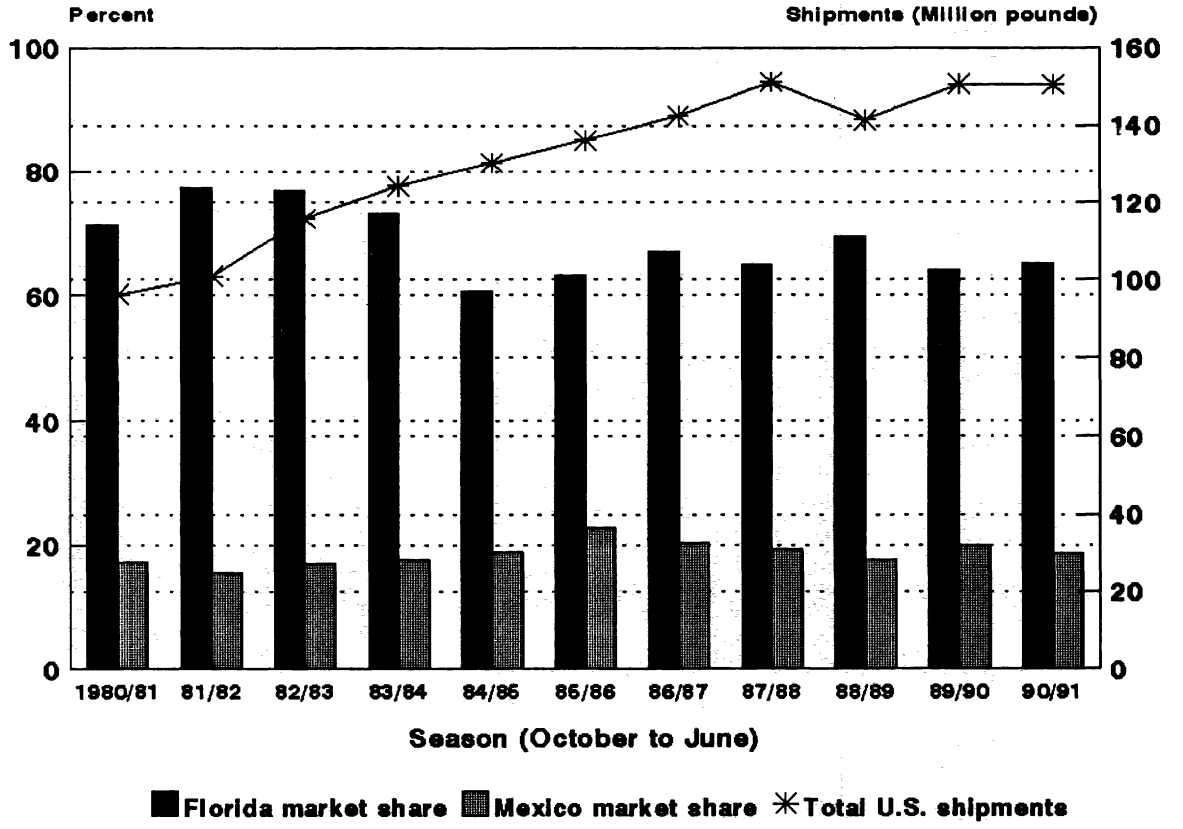


Figure 2

Cucumbers: Market shares for Florida and Mexico

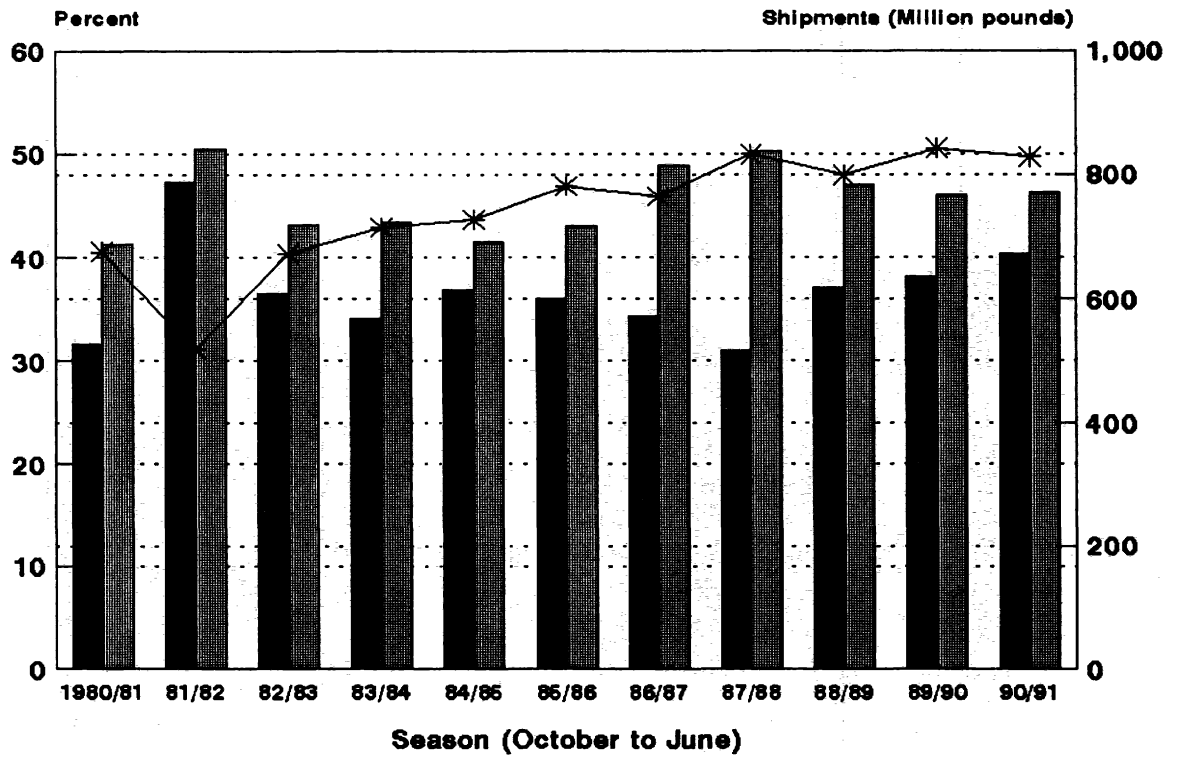


Figure 3

Eggplant: Market shares for Florida and Mexico

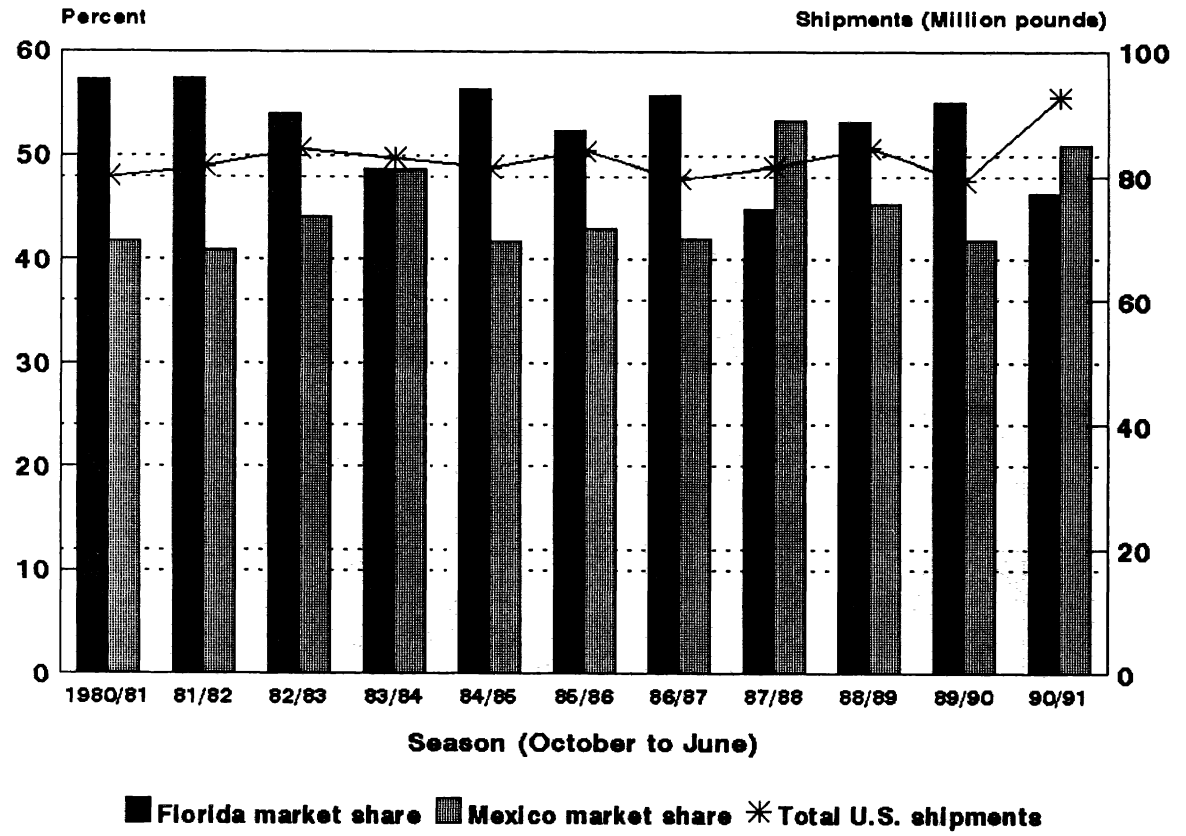


Figure 4

Bell peppers: Market shares for Florida and Mexico

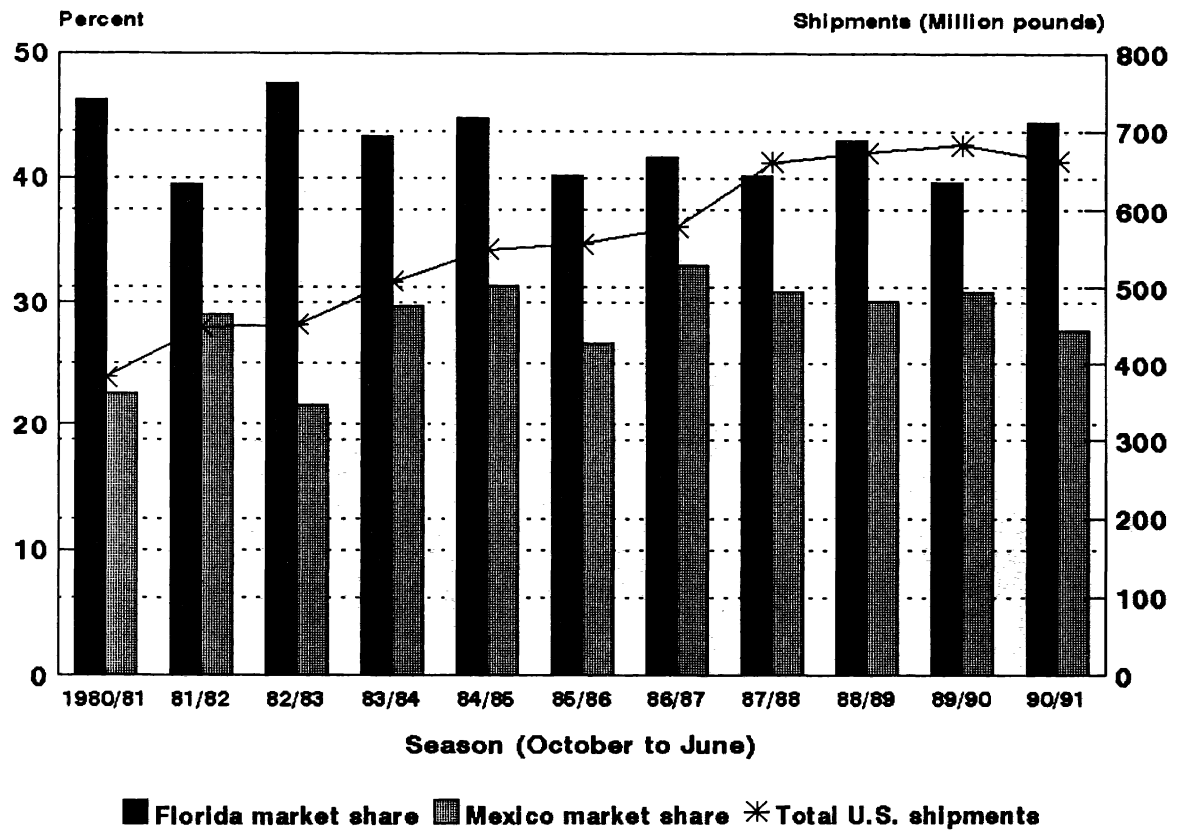


Figure 5

Squash: Market shares for Florida and Mexico

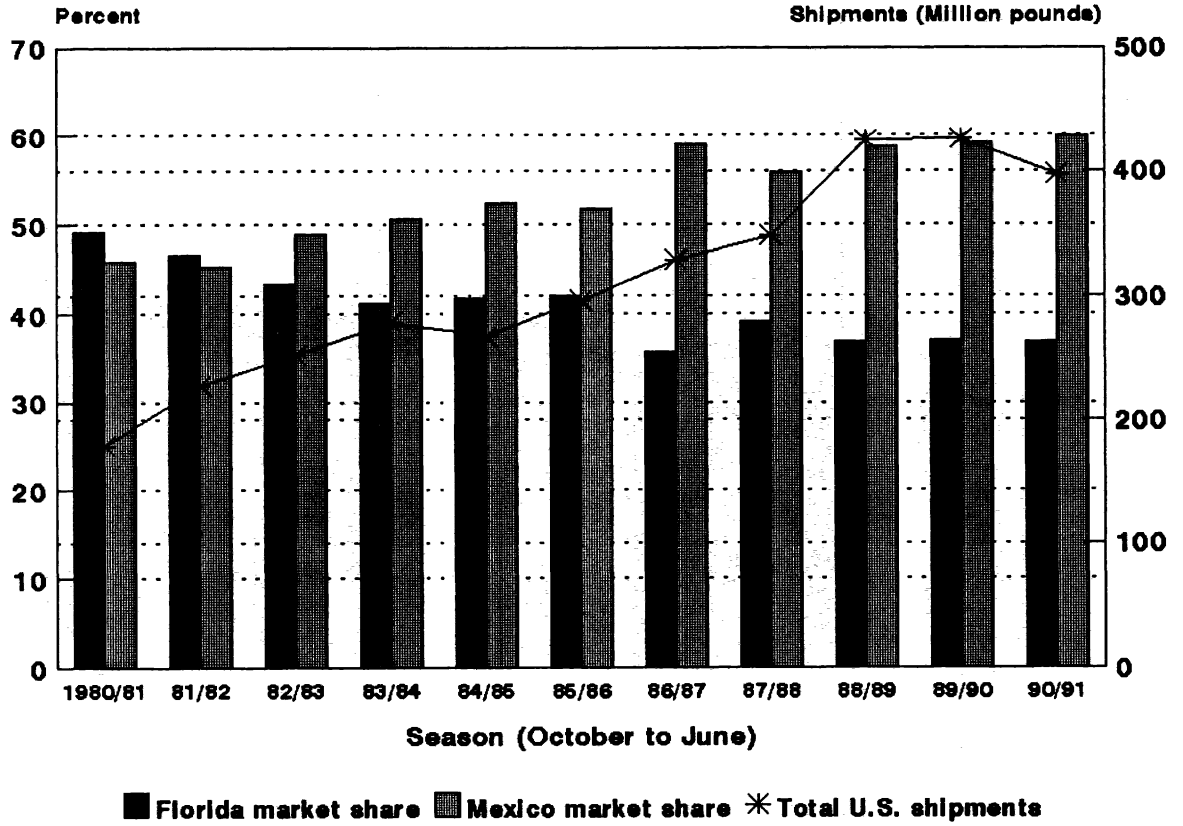
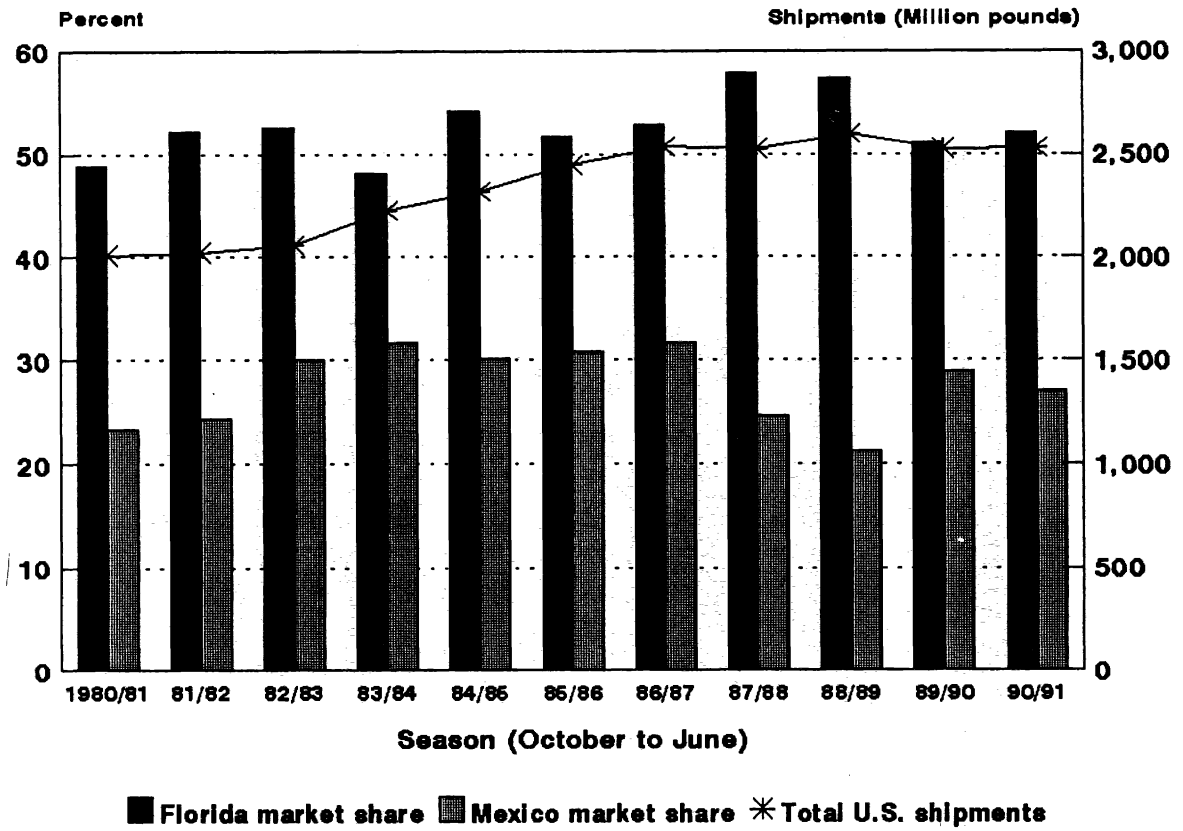


Figure 6

Tomatoes: Market shares for Florida and Mexico



Mexico's market share ranged from 21 percent in 1981/82 to 33 percent in 1985/86, averaging 27 percent. Again, no real trends are evident in the data for the winter period for the green bean market.

Cucumbers

Florida held between 32 and 47 percent of the cucumber market for the October to June market during 1980/81-1987/88 (table 3). Florida's market share gradually increased from a low of 31 percent in the 1987/88 season to a high of 40 percent in 1990/91. Mexico also increased its market share from 41-50 percent during 1980/81-1985/86, to 46-50 percent during 1986/87-1990/91. Florida narrowed the difference in the last 4 years of our analysis in market share from a high of 19 percent in 1987/88 to less than 6 percent in 1990/91.

In the December-April winter market, Florida and Mexico maintained their market shares for cucumbers, with Florida ranging from a low of 21 percent in 1980/81 to highs of 32 percent in 1981/82, 1984/85, and 1990/91, averaging 27 percent. Mexico's market share ranged from a low of 60 percent in 1984/85 to a high of 74 percent in 1987/88, averaging 67 percent.

Florida gained 11 percentage points in market share during 1988/89-90/91 while Mexico lost 11 percentage points. Total market share controlled by the two remained between 93 and 95 percent, indicating a substitution of Florida cucumbers for Mexico cucumbers over the final three seasons.

Eggplant

Florida's market share for eggplant in the October to June market decreased from a high of 57 percent in 1980/81 and 1981/82 to 46 percent in 1990/91 (table 4). The lowest share was 45 percent in 1987/88. Mexico's market share increased significantly from 42 percent in 1980/81 to 51 percent in 1990/91, peaking at 53 percent in 1987/88.

Florida and Mexico have maintained market shares for eggplant in the winter market. Florida's market share ranged from a low of 31 percent in 1987/88 to a high of 43 percent in 1986/87, averaging 38 percent. Florida controlled 38 percent of the market share in the winter period in 1980/81 and 37 percent in 1990/91. Mexico's market share ranged from a low of 55 percent in the 1986/87 season to a high of 68 percent in 1987/88, averaging 60 percent. Mexico controlled 61

Table 3–Cucumbers: Market shares for Florida and Mexico and total shipments in the U.S. domestic market for three market windows

Season	October to June			December to April			May to June		
	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments
	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
1980/81	31.60	41.29	67,597	21.30	69.15	38,098	37.73	1.841	7,897
1981/82	47.19	50.42	51,941	32.30	60.87	38,646	38.14	3.221	5,724
1982/83	36.49	43.16	67,323	23.80	69.67	36,793	59.05	2.601	8,276
1983/84	34.20	43.43	71,447	29.39	67.77	39,258	49.34	2.381	6,235
1984/85	36.87	41.52	72,755	32.01	59.76	44,019	49.86	.911	4,708
1985/86	35.96	43.00	78,132	27.64	65.12	46,836	49.09	1.491	6,835
1986/87	34.40	48.82	76,460	24.23	72.54	44,311	53.04	3.381	5,766
1987/88	31.04	50.23	83,240	21.63	74.12	48,368	54.59	3.761	7,752
1988/89	37.09	46.98	79,914	24.28	70.83	43,603	60.67	4.421	7,362
1989/90	38.09	46.04	84,237	29.44	64.33	50,532	51.25	10.701	7,541
1990/91	40.40	46.26	82,817	32.01	63.77	49,074	51.96	11.221	6,680
Average	35.76	44.65	75,609	27.30	67.06	43,594	50.17	4.191	6,922

Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 4–Eggplant: Market shares for Florida and Mexico and total shipments in the U.S. domestic market for three market windows

Season	October to June			December to April			May to June		
	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments
	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
1980/81	57.21	41.70	8,008	38.03	61.36	5,044	86.50	10.85	1,622
1981/82	57.25	40.88	8,170	42.90	55.90	5,419	80.10	16.22	1,603
1982/83	53.99	44.07	8,439	37.06	61.30	5,248	80.80	16.80	1,839
1983/84	48.67	48.71	8,298	33.43	64.37	5,451	85.06	11.98	1,519
1984/85	56.32	41.68	8,135	41.73	57.13	5,083	91.48	7.61	1,537
1985/86	52.42	43.03	8,405	38.07	59.04	5,540	82.76	7.78	1,543
1986/87	55.73	41.96	7,965	43.12	54.95	5,410	84.20	14.41	1,228
1987/88	44.85	53.39	8,160	31.32	67.51	5,390	79.59	19.70	1,401
1988/89	53.20	45.40	8,449	41.19	57.66	5,793	90.44	8.78	1,423
1989/90	55.05	41.90	7,926	39.42	60.25	4,888	82.84	10.09	1,626
1990/91	46.37	51.04	9,260	37.03	62.84	6,176	76.52	19.05	1,333
Average	52.66	44.93	8,302	38.46	60.23	5,405	83.15	12.87	1,525

Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

percent of the market in 1980/81 and 63 percent of the market in 1990/91.

Bell Peppers

Florida and Mexico have maintained fairly constant market shares for bell peppers in the October to June market (table 5).

Florida's market share for bell peppers ranged from 48 percent in 1982/83 to 39 percent in 1981/82. Florida controlled 46 percent of the market in 1980/81 and 44 percent in 1990/91. Mexico's market share ranged from 22 percent in 1982/83 to 33 percent in 1986/87. Mexico controlled 23 percent of the market in 1980/81 and 28 percent in 1990/91.

In the winter market for bell peppers, Florida's share ranged from 40 to 54 percent, averaging 45 percent, while Mexico's share ranged from 36 to 54 percent, averaging 49 percent. While Florida held the majority market share in the October to June market, Mexico maintained an edge in the December to April market period.

Squash

Market shares for squash show that Florida lost significant market share to Mexico during our study period (table 6). Florida's market share decreased from a high of 49 percent in the 1980/81 season to 37 percent in 1990/91. In contrast, Mexico's market share increased from 46 percent in 1980/81 to 60 percent in 1990/91, apparently at the expense of Florida growers.

In the winter market, Florida again lost market share to Mexico, decreasing from a high of 43 percent in 1980/81 to 32 percent in 1990/91, averaging 34 percent. Mexico, on the other hand, increased from 56 percent in 1980/81 to 65 percent in 1990/91, averaging 62 percent.

Tomatoes

Florida has generally been increasing its market share in tomatoes from 49 percent in 1980/81 to a high of 58 percent in 1987/88 (table 7). Mexico's market share over the same period increased from 23 percent in 1980/81 to a high of 32 percent in 1986/87, ending at

Table 5–Bell peppers: Market shares for Florida and Mexico and total shipments in the U.S. domestic market for three market windows

Season	October to June			December to April			May to June		
	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments
	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
1980/81	46.24	22.50	38,146	45.51	42.29	19,924	68.21	1.20	10,378
1981/82	39.47	29.03	44,774	43.93	48.25	25,915	42.38	4.91	9,842
1982/83	47.59	21.61	45,091	52.71	36.37	25,147	58.01	5.73	10,290
1983/84	43.28	29.72	50,718	45.27	49.27	29,509	53.32	3.42	12,825
1984/85	44.83	31.39	54,915	41.55	53.36	31,354	58.16	1.37	14,060
1985/86	40.21	29.69	55,646	40.17	50.62	31,754	48.81	1.64	14,043
1986/87	41.72	33.02	57,751	43.23	51.31	35,384	49.85	5.11	11,509
1987/88	40.15	30.92	66,023	42.93	51.58	37,351	52.80	4.40	15,325
1988/89	43.03	30.07	67,290	47.25	48.87	38,483	48.55	5.41	15,155
1989/90	39.71	30.93	68,257	42.93	54.14	36,841	47.29	2.88	18,353
1990/91	44.45	27.71	66,200	53.78	43.41	39,159	39.42	3.73	14,694
Average	42.57	29.51	55,911	45.39	49.24	31,884	50.96	3.56	13,335

Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 6–Squash: Market shares for Florida and Mexico and total shipments in the U.S. domestic market for three market windows

Season	October to June			December to April			May to June		
	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments
	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
1980/81	49.05	45.84	17,900	43.11	55.70	12,482	64.68	12.59	2,534
1981/82	46.56	45.24	22,758	42.16	52.90	17,398	47.03	20.84	2,471
1982/83	43.33	48.82	25,214	34.91	59.82	17,145	67.67	19.00	4,247
1983/84	41.10	50.62	27,852	37.05	57.12	20,791	54.30	26.72	3,020
1984/85	41.68	52.42	26,750	36.49	59.46	20,850	63.68	19.34	2,379
1985/86	41.96	51.66	29,624	36.96	57.96	21,721	62.10	24.65	3,185
1986/87	35.62	59.06	32,862	28.31	68.30	23,714	49.85	38.69	4,058
1987/88	39.14	55.84	34,841	35.32	61.26	26,182	54.07	33.61	4,385
1988/89	36.79	58.66	42,478	31.07	65.89	31,130	51.36	39.91	4,636
1989/90	36.87	59.22	42,592	31.04	65.90	32,847	49.49	38.66	3,637
1990/91	36.82	59.86	39,712	32.14	65.25	29,863	38.32	49.27	3,854
Average	39.86	54.56	31,160	34.42	61.84	23,102	50.51	30.82	3,508

Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 7–Tomatoes: Market shares for Florida and Mexico and total shipments in the U.S. domestic market for three market windows

Season	October to June			December to April			May to June		
	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments	Florida's share	Mexico's share	Total shipments
	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
1980/81	48.89	23.44	200,953	52.64	43.09	97,800	55.13	5.94	63,086
1981/82	52.26	24.48	202,179	57.60	38.54	112,057	56.05	11.83	51,833
1982/83	52.64	30.02	205,716	55.06	42.76	111,585	63.78	18.20	56,724
1983/84	48.10	31.62	222,399	50.66	47.61	118,252	52.66	12.22	61,866
1984/85	54.24	30.15	231,892	50.28	48.24	124,470	66.56	7.39	64,678
1985/86	51.67	30.79	244,699	49.83	47.44	132,430	68.05	8.21	65,246
1986/87	52.85	31.63	253,560	54.55	43.52	140,187	65.80	12.45	64,764
1987/88	57.87	24.72	252,648	61.46	35.73	137,604	68.87	9.07	69,482
1988/89	57.30	21.27	260,011	67.68	29.79	133,822	58.21	11.48	71,255
1989/90	51.11	28.92	252,677	53.37	43.92	127,617	59.20	9.65	68,502
1990/91	52.12	27.10	253,194	58.94	39.47	142,263	51.28	12.92	58,791
Average	52.87	27.71	234,125	55.84	41.68	125,281	61.11	10.79	62,879

Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

27 percent in 1990/91. In the winter market, Florida's market share increased from 53 percent in 1980/81 to 59 percent in 1990/91, averaging 56 percent. Mexico's market share decreased slightly from 43 percent in 1980/81 to 39 percent in 1990/91, averaging 42 percent.

Summary

The winter market is generally when Florida and Mexico are both in full production and when the most direct competition exists. When comparing market shares during this winter period with the full season market shares, Florida's market share decreases for all vegetables and Mexico's market share increases for all vegetables. Mexico's share of the market increases significantly for cucumbers to 67 percent, eggplant to 60 percent, bell peppers to 49 percent, squash to 62 percent, and tomatoes to 42 percent. Mexico has become the major market supplier of cucumbers, eggplant, bell peppers, and squash in the U.S. domestic market during this winter market. However, Florida still holds the largest market share for green beans and tomatoes.

The Seasonal Nature of Competition Between Florida and Mexico

Tables 8 through 13 and figures 7 through 12 show the monthly variation in shipments of six major vegetables produced in Florida and Mexico. Florida's shipments tend to peak in November/December and April/May, whereas Mexico's shipments tend to peak during January-March. Peaks in market share follow these same trends.

One might conclude from these data that Florida and Mexico are somewhat complementary in their production of these six major vegetable crops. However, the standard deviation of the market shares indicates competition between Florida and Mexico in several months of the year for each of these crops. Standard deviations measure the volatility of market share around the average during 1980/81-1990/91. Higher standard deviations indicate that market shares have fluctuated more, meaning market shares have changed significantly from year to year. Thus, higher standard deviations may indicate more intense competition in the market.

Table 8--Green beans: Average monthly shipments, market share, and standard deviation for market share for Florida and Mexico in the U.S. market, 1979/80-1990/91 seasons

Season	Florida			Mexico			Total U.S. market
	Total shipments	Market share	Standard deviation	Total shipments	Market share	Standard deviation	
	10,000 pounds	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
October	184	28.36	17.08	9	1.45	1.68	650
November	1,239	86.18	8.34	46	3.19	2.25	1,438
December	1,358	72.85	5.61	494	26.51	5.33	1,864
January	927	59.47	20.24	620	39.77	19.91	1,558
February	801	60.56	21.78	511	38.59	20.95	1,323
March	1,288	73.05	10.62	461	26.13	10.18	1,763
April	1,722	86.41	4.14	247	12.39	4.03	1,993
May	88	70.64	15.55	56	3.12	1.14	1,805
June		12.55	11.07	20	2.80	1.66	704
October-November	1,424	68.17	N.A.	55	2.65	N.A.	2,088
December-April	6,096	71.71	N.A.	2,332	27.43	N.A.	8,501
May-June	1,364	54.34	N.A.	76	3.03	N.A.	2,509
October-June	8,883	67.82	N.A.	2,463	18.81	N.A.	13,099

N.A. = Not applicable.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 9--Cucumbers: Average monthly shipments, market share, and standard deviation for market share for Florida and Mexico in the U.S. market, 1979/80-1990/91 seasons

Season	Florida			Mexico			Total U.S. market
	Total shipments	Market share	Standard deviation	Total shipments	Market share	Standard deviation	
	10,000 pounds	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
October	2,084	37.23	11.45	288	5.14	4.72	5,597
November	4,591	47.95	7.61	3,566	37.24	8.13	9,576
December	2,521	26.44	6.79	6,658	69.84	7.15	9,533
January	1,027	11.81	5.08	7,242	83.26	5.95	8,698
February	625	8.13	3.13	6,549	85.16	4.48	7,690
March	1,908	22.91	9.19	6,018	72.27	9.40	8,327
April	5,821	62.29	11.14	2,767	29.61	12.36	9,346
May	7,103	66.78	7.58	477	4.49	2.79	10,637
June	1,387	22.07	10.18	232	3.68	3.64	6,285
October-November	6,675	43.99	N.A.	3,854	25.40	N.A.	15,173
December-April	11,902	27.30	N.A.	29,234	67.06	N.A.	43,594
May-June	8,490	50.17	N.A.	709	4.19	N.A.	16,922
October-June	27,067	35.76	N.A.	33,797	44.65	N.A.	75,689

N.A. = Not applicable.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 10--Eggplant: Average monthly shipments, market share, and standard deviation for market share for Florida and Mexico in the U.S. market, 1979/80-1990/91 seasons

Season	Florida			Mexico			Total U.S. market
	Total shipments	Market share	Standard deviation	Total shipments	Market share	Standard deviation	
	10,000 pounds	*------ Percent ------*		*10,000 pounds*	*------ Percent ------*		*10,000 pounds*
October	386	88.18	10.98	17	3.90	4.83	438
November	639	68.40	13.46	262	27.99	13.12	935
December	528	48.55	7.61	533	48.97	7.75	1,088
January	472	39.48	10.28	712	59.60	10.27	1,195
February	247	24.83	9.75	740	74.31	9.87	996
March	300	27.63	11.81	771	70.95	11.52	1,087
April	531	51.11	13.12	499	48.04	12.83	1,039
May	747	80.29	6.75	178	19.12	6.63	930
June	521	87.63	9.11	19	3.12	3.53	595
October-November	1,025	74.71	N.A.	279	20.31	N.A.	1,373
December-April	2,078	38.46	N.A.	3,255	60.23	N.A.	5,404
May-June	1,268	83.15	N.A.	196	12.87	N.A.	1,525
October-June	4,372	52.66	N.A.	3,730	44.93	N.A.	8,302

N.A. = Not applicable.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 11--Bell peppers: Average monthly shipments, market share, and standard deviation for market share for Florida and Mexico in the U.S. market, 1979/80-1990/91 seasons

Season	Florida			Mexico			Total U.S. market
	Total shipments	Market share	Standard deviation	Total shipments	Market share	Standard deviation	
	10,000 pounds	*------ Percent ------*		*10,000 pounds*	*------ Percent ------*		*10,000 pounds*
October	317	6.39	3.06	101	2.03	1.72	4,963
November	2,216	38.69	6.66	224	3.91	3.13	5,729
December	3,329	51.07	5.36	1,988	30.50	6.00	6,518
January	2,610	36.61	12.34	4,221	59.19	15.21	7,131
February	1,642	28.58	13.31	4,010	69.80	13.74	5,745
March	2,455	38.39	13.27	3,828	59.87	12.43	6,395
April	4,436	72.79	8.81	1,652	27.11	8.60	6,094
May	5,056	70.87	8.51	340	4.77	3.04	7,134
June	1,739	28.05	14.55	134	2.17	1.46	6,201
October-November	2,534	23.70	N.A.	324	3.03	N.A.	10,692
December-April	14,472	45.39	N.A.	15,700	49.24	N.A.	31,884
May-June	6,795	50.96	N.A.	475	3.56	N.A.	13,335
October-June	23,801	42.57	N.A.	16,499	29.51	N.A.	55,911

N.A. = Not applicable.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 12--Squash: Average monthly shipments, market share, and standard deviation for market share for Florida and Mexico in the U.S. market, 1979/80-1990/91 seasons

Season	Florida			Mexico			Total U.S. market
	Total shipments	Market share	Standard deviation	Total shipments	Market share	Standard deviation	
	10,000 pounds	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
October	746	59.70	9.35	390	31.23	10.27	1,250
November	1,826	55.32	6.61	1,242	37.64	6.20	3,300
December	1,568	36.04	6.19	2,662	61.19	6.85	4,350
January	1,049	21.77	7.05	3,709	76.95	7.25	4,820
February	957	20.32	5.83	3,690	78.36	5.85	4,709
March	1,782	38.70	9.53	2,688	58.37	9.22	4,605
April	2,596	56.20	10.86	1,539	33.31	10.03	4,619
May	1,693	61.84	9.81	824	30.08	9.03	2,738
June	203	26.38	9.90	257	33.45	12.17	770
October-November	2,572	56.52	N.A.	1,633	35.88	N.A.	4,550
December-April	7,952	34.42	N.A.	14,287	61.84	N.A.	23,102
May-June	1,772	50.51	N.A.	1,081	30.82	N.A.	3,508
October-June	12,420	39.86	N.A.	17,000	54.56	N.A.	31,160

N.A. = Not applicable.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 13--Tomatoes: Average monthly shipments, market share, and standard deviation for market share for Florida and Mexico in the U.S. market, 1979/80-1990/91 seasons

Season	Florida			Mexico			Total U.S. market
	Total shipments	Market share	Standard deviation	Total shipments	Market share	Standard deviation	
	10,000 pounds	------ *Percent* ------		*10,000 pounds*	------ *Percent* ------		*10,000 pounds*
October	2,087	8.81	4.98	3,075	12.98	6.76	23,686
November	13,321	59.70	6.34	2,787	12.51	6.81	22,279
December	18,410	83.66	4.02	2,309	10.49	5.69	22,005
January	13,968	57.78	16.42	9,846	40.73	17.29	24,175
February	8,216	36.17	13.41	14,107	62.11	13.63	22,714
March	10,799	39.36	17.52	15,912	58.00	18.85	27,436
April	18,564	64.12	11.73	10.048	34.71	11.72	28,952
May	27,443	81.81	7.05	3,995	11.91	5.94	33,543
June	10,982	37.44	14.13	2,791	9.51	2.82	29,336
October-November	15,409	33.52	N.A.	5,862	12.75	N.A.	45,965
December-April	69,957	55.84	N.A.	52,223	41.68	N.A.	125,281
May-June	38,425	61.11	N.A.	6,786	10.79	N.A.	62,879
October-June	123,791	52.87	N.A.	64,870	27.71	N.A.	234,125
January-April	51,546	49.91	N.A.	49,914	48.33	N.A.	103,276

N.A. = Not applicable.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Figure 7

Green beans: Average monthly shipments from Florida and Mexico, 1979/80-1990/91

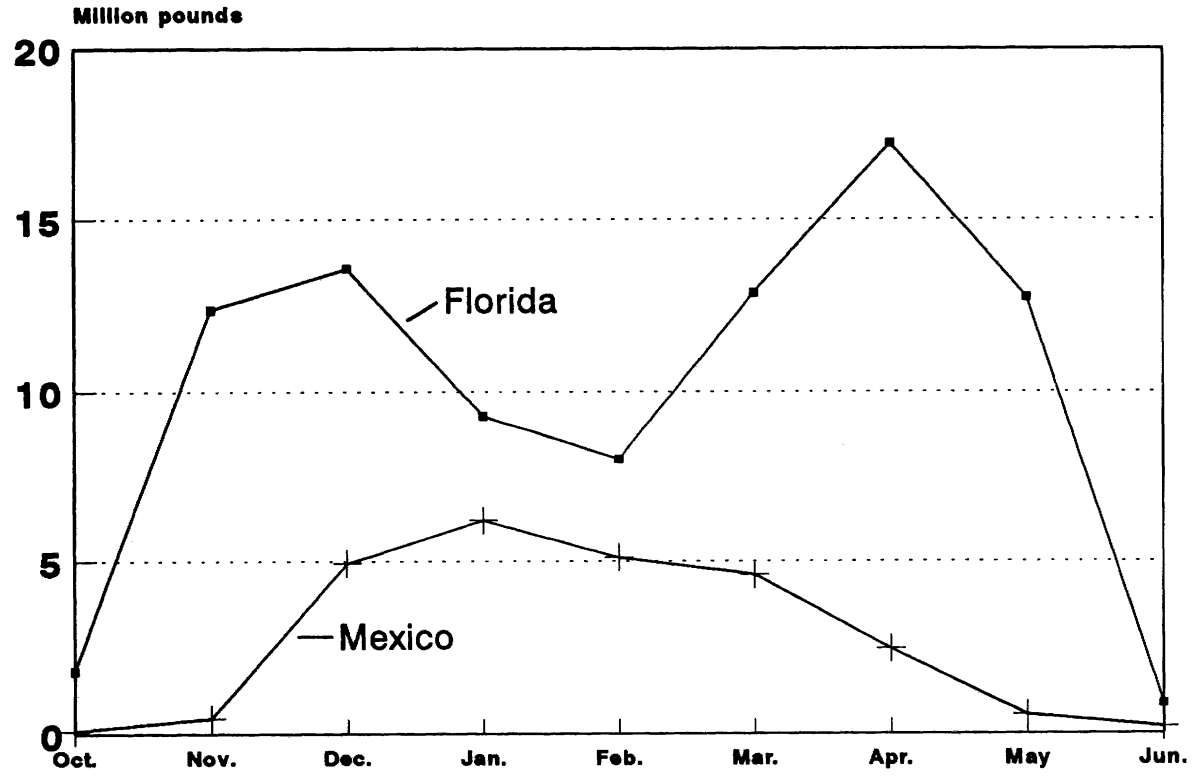


Figure 8

Cucumbers: Average monthly shipments from Florida and Mexico, 1979/80-1990/91

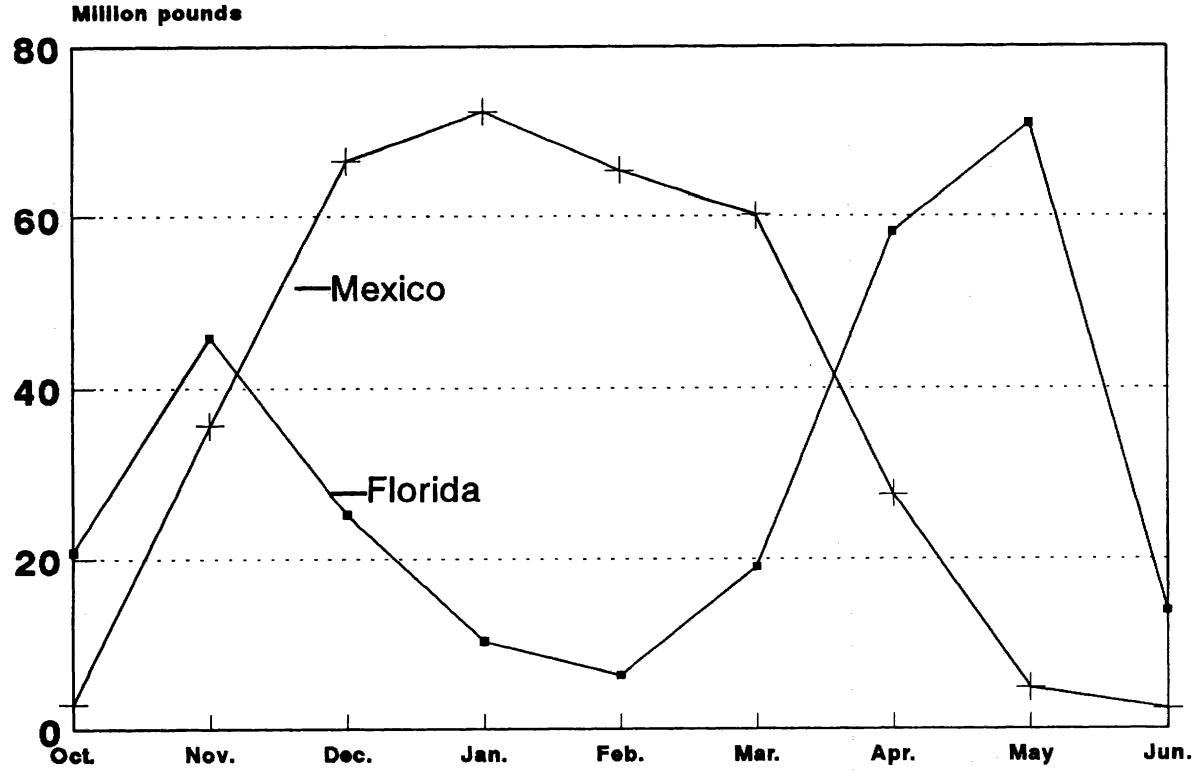


Figure 9

Eggplant: Average monthly shipments from Florida and Mexico, 1979/80-1990/91

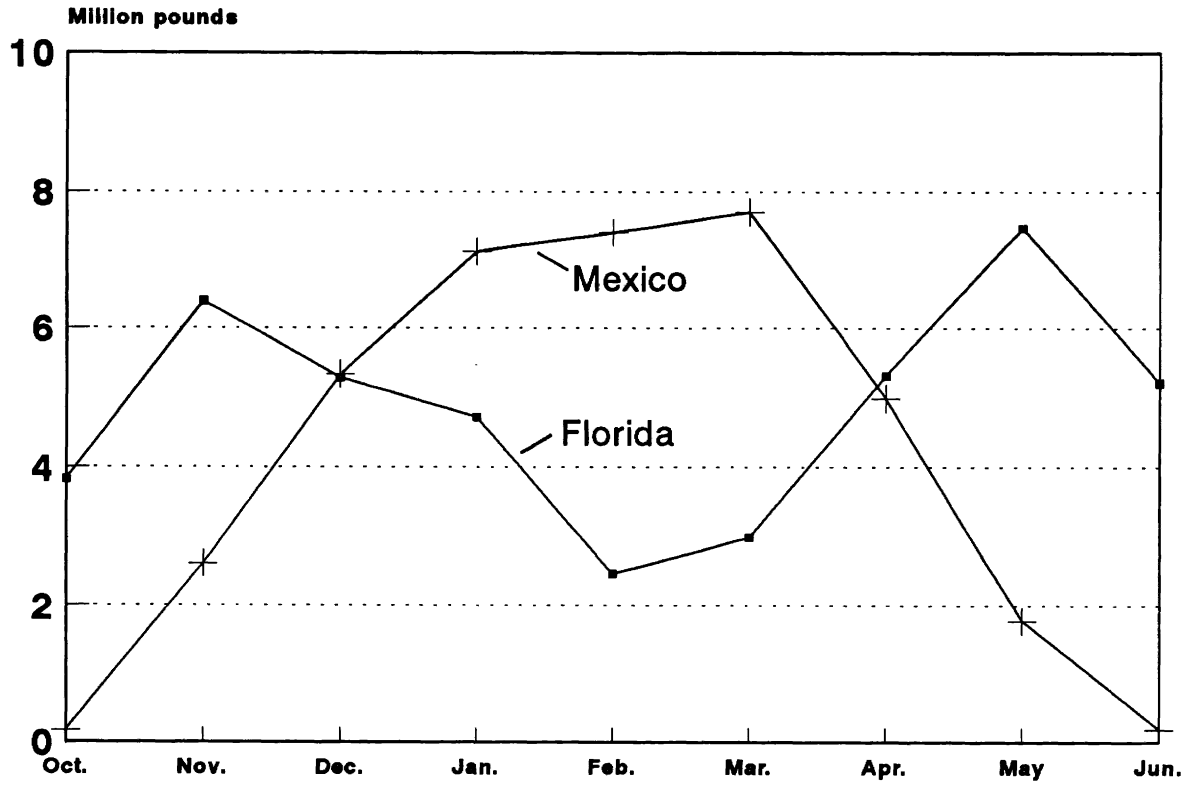


Figure 10

Bell peppers: Average monthly shipments from Florida and Mexico, 1979/80-1990/91

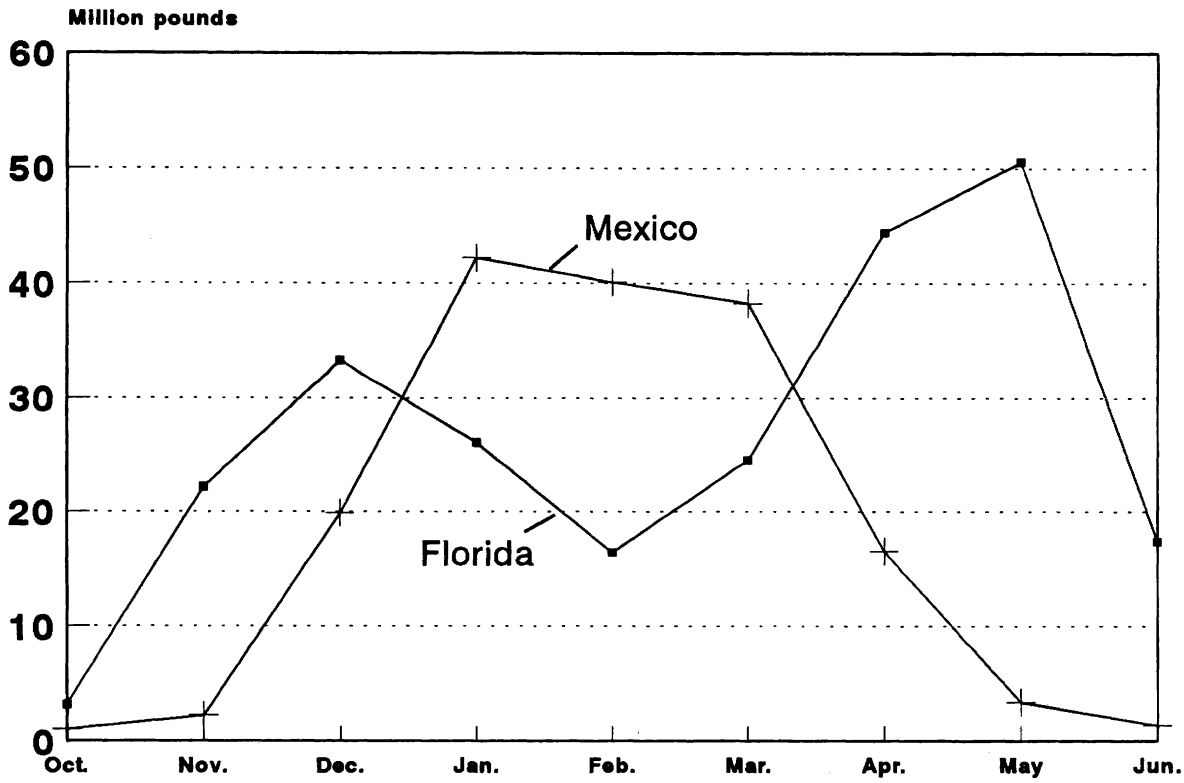


Figure 11

Squash: Average monthly shipments from Florida and Mexico, 1979/80-1990/91

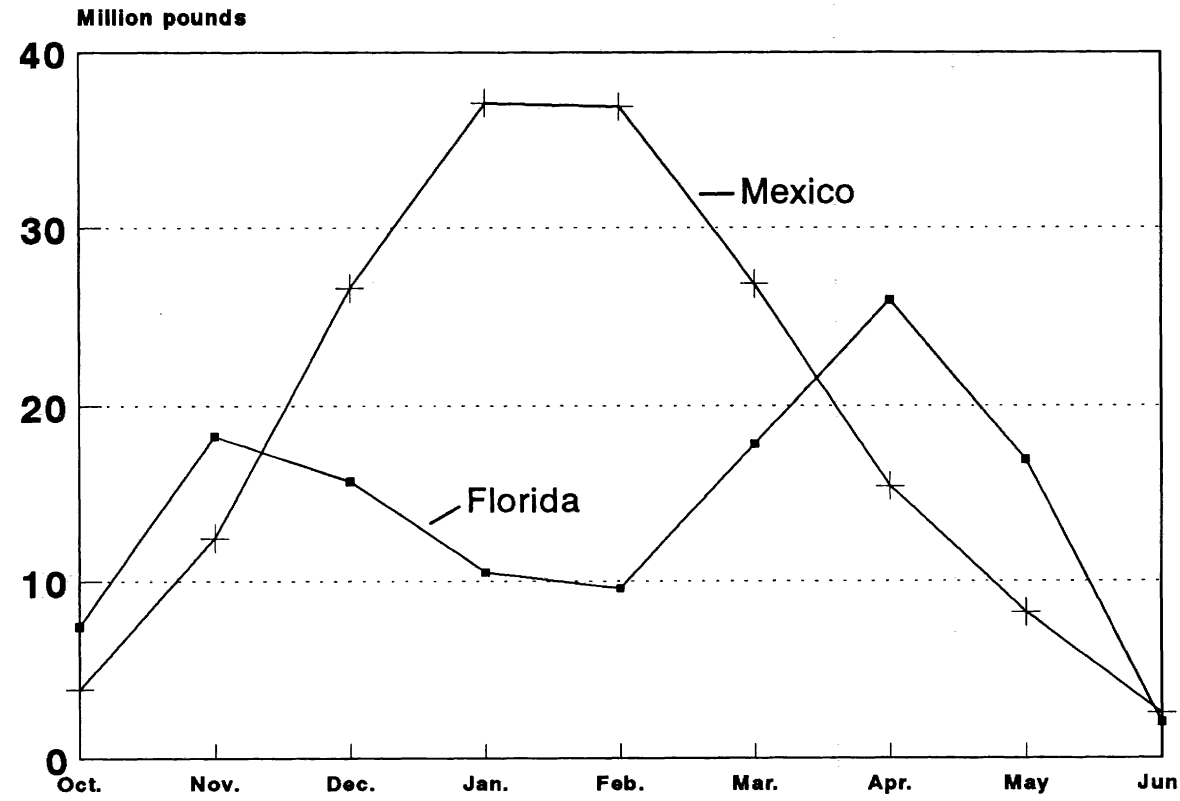
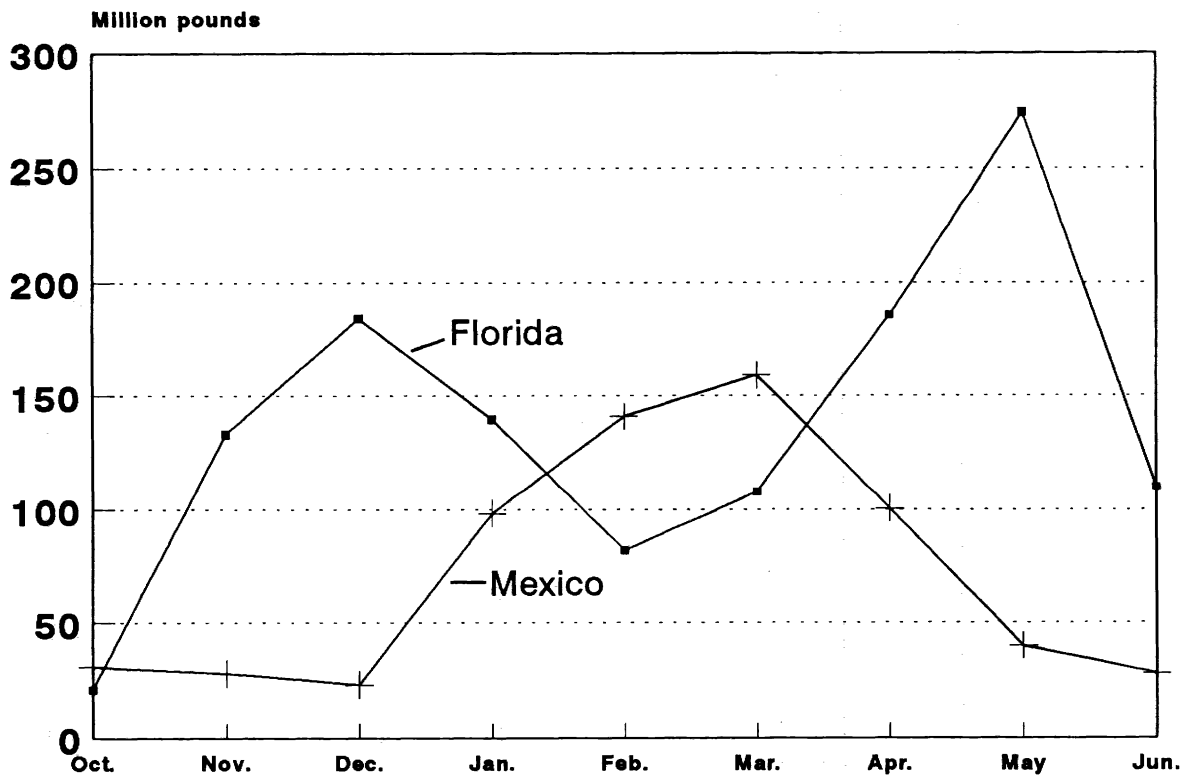


Figure 12

Tomatoes: Average monthly shipments from Florida and Mexico, 1979/80-1990/91



High market shares and standard deviations for both Florida and Mexico indicate more intense competition between the two areas. High market share and standard deviation for one area and not the other indicate competition with other areas. For example, Florida had an October market share average of 28.36 percent for 1980/81-1990/91 for green beans with a relatively high standard deviation of 17.08. In contrast, Mexico averaged only 1.45 percent in market share over this same period with a standard deviation on market share of 1.68. These results would indicate that Florida competes in the October market for green beans and faces intense competition with producers other than Mexico. By comparison, Florida and Mexico are both significant producers in the month of January with Florida averaging 59.47 percent in market share and Mexico averaging 39.77 percent. The two areas average over 99 percent of the total market. The standard deviation in market share is 20.24 for Florida and 19.91 for Mexico, indicating large shifts in market share during the 11 seasons we studied and substitution in market shares between Florida and Mexico. This finding would indicate volatile supplies and potentially intense competition between Florida and Mexico.

Examination of monthly market shares and standard deviations in market shares indicates competition between Florida and Mexico in all crops for at least some months of the winter market. If we use general levels of 90-percent combined market share for the two areas and standard deviations of more than 10 for both areas as guides for when competition occurs, we see that Florida and Mexico compete during January through March for green beans. Competition in the cucumber market occurs in March and April, eggplant November and January through April, bell peppers January through March, and tomatoes January through April. Competition also exists in October and from March through May for squash.

Examination of production patterns for vegetables in Florida also yields supporting data concerning competition. The Florida Agricultural Statistics Service (FASS) has identified four major vegetable-producing areas during the winter production season: the southeast, southwest, Everglades, and west central areas (FASS, 1992). These areas are similar to production areas delineated by the Florida Tomato Marketing Order (Florida Tomato Committee, 1992). However, no tomatoes are grown in the Everglades area, and the Florida Tomato Committee splits the southeast production area into two separate areas, Dade County and the rest of the southeast production area. Seasonal shipments by area are not identified by FASS, but the Florida Tomato Committee tracks shipments of tomatoes by production area throughout the season.

Table 14 shows the monthly shipments of tomatoes from each of the major producing areas in Florida as identified by the Florida Tomato Committee, the total shipments from Florida and from Mexico, and the distribution of those shipments from each of the producing areas and Mexico. The results indicate a somewhat complementary relationship in shipments from all of Florida and Mexico, considering that the distribution of Florida shipments peaks in December at 15.2 percent and again in May at 21.9 percent, while Mexico's shipments peak in March at 24.8 percent (fig. 13).

The distribution of shipments by producing area within Florida gives different results. Producers in Dade County produce tomatoes in an almost identical seasonal pattern when compared with Mexico's distribution of shipments throughout the season (fig. 14). Thus, Dade County producers directly compete with Mexican producers during the winter market for fresh tomatoes in the United States. Competition in the other producing areas is not as strong as in Dade County, but should be considered significant. During January to April, considered to be Mexico's peak producing period (76 percent of its total production), Dade County producers ship 86.8 percent of their tomatoes, other southeast producers ship 66.4 percent, southwest producers ship 48.9 percent, and the west central producers ship 12.5 percent of their tomatoes. The strongest competition is between Dade County producers and Mexico, with strong competition between other southeast Florida producers and Mexico and significant competition between southwest Florida producers and Mexico. Only minor competition exists between west central Florida producers and Mexico.

The data indicate a strong level of competition between Florida producers and Mexican producers when looking at the shipments by area of production. The large volume of production in the west central Florida production area skews the total Florida shipments, making it appear as though more complementary production exists. This large production in west central Florida clouds the competition that really exists between Mexico and those producers outside the west central Florida production area.

Although similar data are not available for the other crops, the same seasonal pattern of shipments would be suggested if shipments could be shown by production area in Florida.

Table 14–Tomatoes: Average monthly distribution of shipments, Florida and Mexico, 1979/80-1990/91 seasons

Month/season	Florida										Mexico	
	Dade County		Southeast		Southwest		West central		State total			
	Shipments	Share	Shipments	Share	Shipments	Share	Shipments	Share	Shipments	Share	Shipments	Share
	10,000 pounds	*Percent*	*10,000 pounds*	*Percent*	*10,000 pounds*	*Percent*	*10,000 pounds*	*Percent*	*10,000 pounds*	*Percent*	*10,000 pounds*	*Percent*
October	41	0.2	52	0.4	561	1.2	1,587	3.4	2,242	1.7	3,129	4.9
November	277	1.3	1,233	9.4	6,620	14.3	8,173	17.4	16,303	12.7	2,833	4.4
December	2,328	10.5	2,339	17.8	10,603	22.9	4,256	9.0	19,526	15.2	2,173	3.4
January	4,832	21.9	2,229	17.0	6,671	14.4	740	1.6	14,473	11.3	9,823	15.2
February	4,283	19.4	1,813	13.8	2,823	6.1	59	.1	8,978	7.0	13,997	21.7
March	5,796	26.2	2,294	17.5	4,249	9.2	664	1.4	13,003	10.1	16,018	24.8
April	4,293	19.4	2,376	18.1	8,911	19.3	4,463	9.5	20,044	15.6	9,818	15.2
May	257	1.2	780	5.9	5,388	11.6	21,679	46.1	28,103	21.9	3,969	6.2
June	5	0	1	0	453	1.0	5,431	11.5	5,889	4.6	2,736	4.2
Season totals:												
October-June	22,113	100.0	13,116	100.0	46,278	100.0	47,053	100.0	128,560	100.0	64,496	100.0
December-April	21,532	97.4	11,051	84.3	33,257	71.9	10,183	21.6	76,023	59.1	51,829	80.3
January-April	19,204	86.8	8,712	66.4	22,654	49.0	5,927	12.6	56,497	43.9	49,656	77.0
Share[1]	N.A.	17.2	N.A.	10.2	N.A.	36.0	N.A.	36.6	N.A.	100.0	N.A.	N.A.

N.A. = Not applicable.

[1] Area's share of total Florida shipments.

Source: Florida Tomato Committee, various issues; U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Figure 13

Tomatoes: Average monthly distribution of shipments from Florida and Mexico, 1979-1990/91

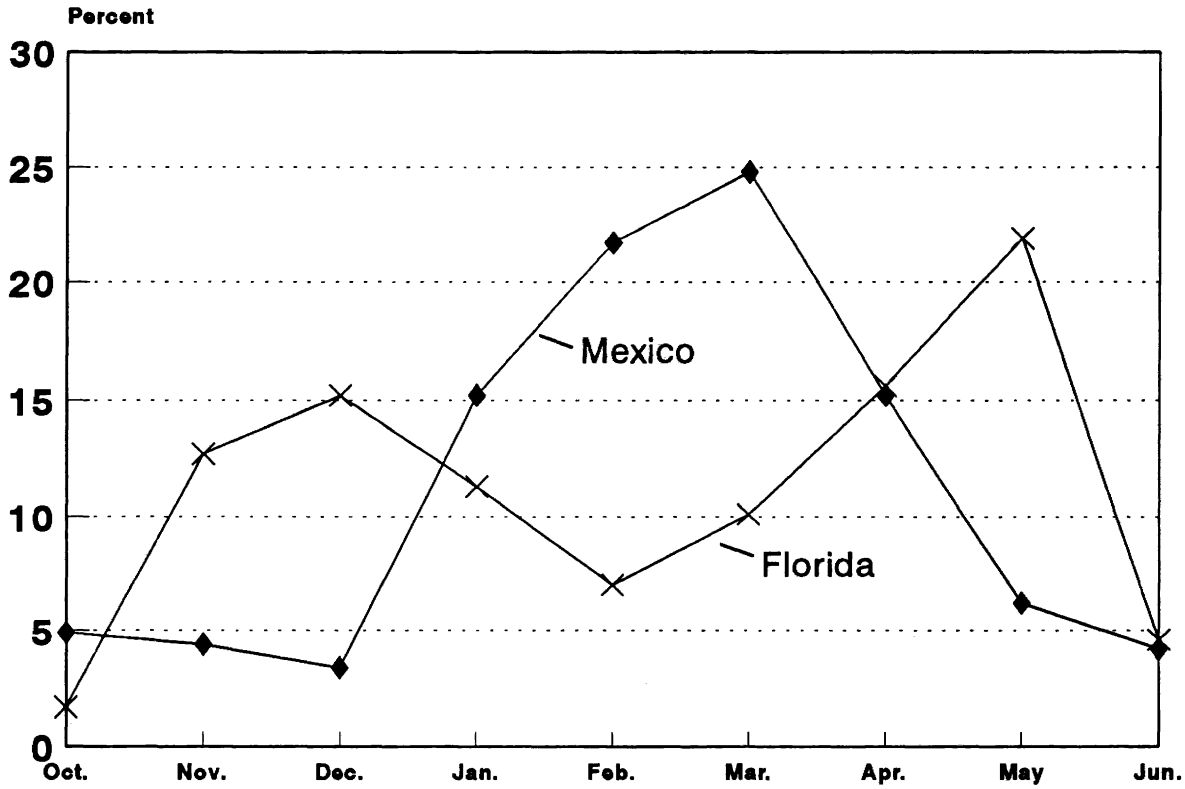
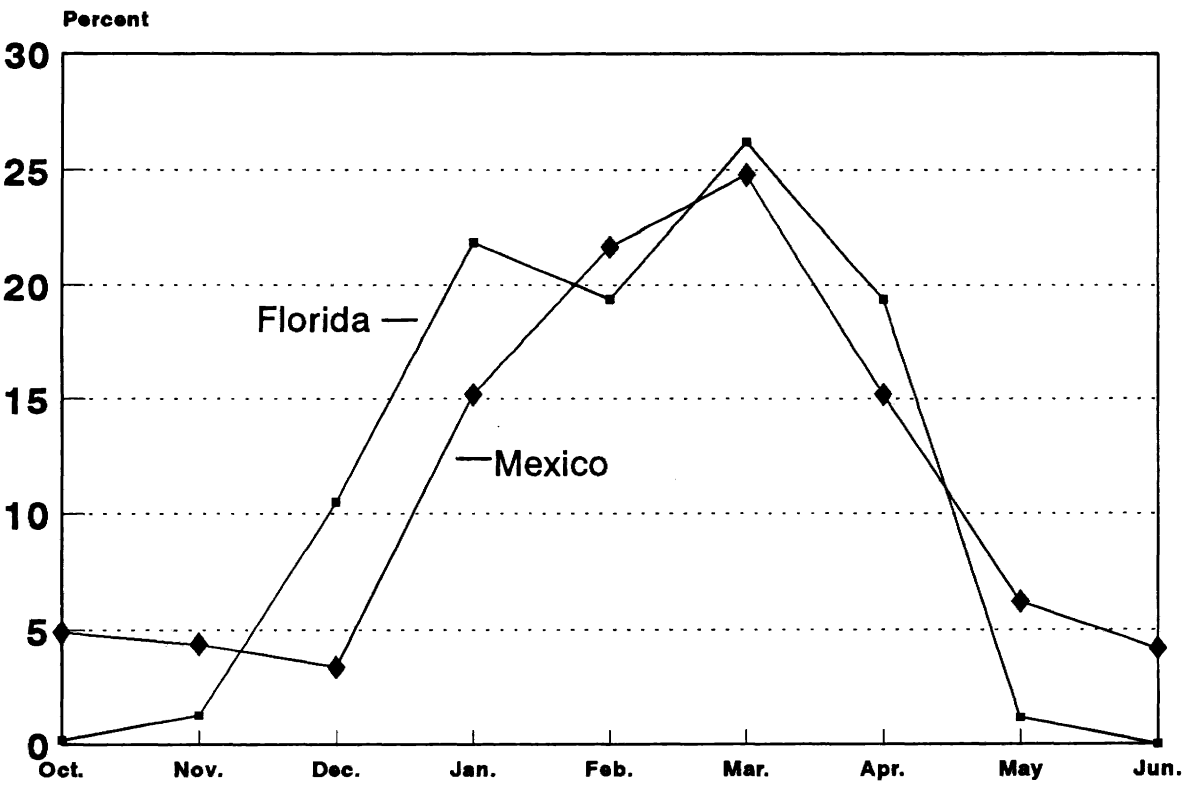


Figure 14

Tomatoes: Average monthly distribution of shipments from Dade County, Florida and Mexico, 1979-1990/91



Historical Market Shares in Terminal Markets

Arrivals of produce in terminal markets represent the quantity demanded at wholesale level for produce from different shipping areas. The U.S. Department of Agriculture (USDA) monitors the volume of produce that enters several of the more important markets and the prices that are charged for these items by first handlers of the product in those markets. Much as market shares at shipping point represent measurements of competition at shipping point, wholesale-market shares also measure levels of competition at the wholesale-market level. Changes in competition at wholesale may differ across markets because of different factors that affect costs of arrival as well as differences in tastes and preferences of consumers in the different markets.

Cottrell and Lucier (1991) studied U.S.-Mexico vegetable trade and examined market shares for Mexico, Florida, California, and other domestic supplying areas for fresh tomatoes in each of the 23 terminal market cities for which arrivals were monitored during 1987-90. Florida was the largest supplier of fresh tomatoes over that period, but its market share declined from a high of 45.3 percent in 1988 to 38.6 percent in 1990 (table 15). Mexico's market share also slightly declined from 21.1 percent in 1987 to 18.7 percent in 1990. California's market share changed little, remaining at 23.9 percent except for 1989 when it rose to 25 percent. The loss in market share for Florida and Mexico was attributed to other supplying areas as their market share increased from 13.9 percent in 1987 to 18.8 percent in 1990.

Although these annual market shares indicate changes in competition in the market for fresh tomatoes, a more precise picture of changes in competition in the winter market can be seen by examining changes in market share during the winter season. We analyzed the arrivals of four major vegetables (green beans, cucumbers, bell peppers, and tomatoes) in four regional terminal market cities (Atlanta, New York City, Chicago, and Los Angeles) during the winter season (December to April) for 1979/80-1989/90.

Table 15--U.S. market shares for sources of fresh tomatoes in 23 cities

Year	Florida	Mexico	California	Other areas
		Percent		
1987	41.5	21.1	23.9	13.9
1988	45.3	17.0	23.9	13.8
1989	43.4	16.4	25.0	15.2
1990	38.6	18.7	23.9	18.8

Source: Cottrell and Lucier, 1991.

Green Beans

Florida generally maintained its market share for green beans at a constant level through the 1980's up to the 1989/90 season when a severe freeze in December 1990 cost Florida some market share (table 16). Florida has been the dominant supplier of green beans in Atlanta, New York City, and Chicago. Mexico has been the dominant supplier in the Los Angeles market. There appears to be little overlap in the supplies of green beans in any of the markets. The total market for green beans did not change significantly in any of the markets except in New York where the data indicate the market decreased in size significantly from more than 10 million pounds in 1979/80 to fewer than 4 million pounds in 1989/90. However, this apparent decrease in market size should not be considered significant because of data reporting problems in New York City. Statistics from the other markets indicate that 85 percent or more of the total unloads have been recorded in their areas since 1983. New York City statistics, however, indicate that reporting accuracy declined from 90 percent in 1983 to only 60 percent in 1990, which explains a large part of the recorded drop in unloads for New York City. Although market size is difficult to judge because of the reporting problems, the data should be fairly accurate for analyzing market shares and competition.

Cucumbers

Market shares for cucumbers (table 17) show that Mexico has been the major supplier of cucumbers in all markets except Atlanta, where Florida has been the dominant supplier. Florida did have larger market shares than Mexico in the New York City market 4 of the 11 years we studied, but on average, Mexico has supplied 52 percent of the New York City market compared with Florida's 40 percent. No discernable trends in market share are obvious in the data with the exception of Los Angeles, where Mexico increased its market share from 55 percent in 1980/81 to 93 percent in 1989/90, but at the expense of suppliers other than Florida, which does not ship significant supplies into the Los Angeles market. The total market increased significantly in all markets except for New York where data problems complicate judging market growth.

Bell Peppers

Market shares for bell peppers (table 18) show that Florida dominates the markets in New York City,

Table 16--Green beans: Florida's and Mexico's shipments to and market shares at selected terminal markets[1]

City/year	Florida		Mexico	
	Quantity	Share	Quantity	Share
	10,000 pounds	*Percent*	*10,000 pounds*	*Percent*
Atlanta:				
1979/80	343.00	99.13	3.00	0.87
1980/81	221.00	88.40	28.00	11.20
1981/82	231.00	100.00	0	0
1982/83	208.00	100.00	0	0
1983/84	191.00	100.00	0	0
1984/85	159.00	86.41	23.00	12.50
1985/86	237.00	99.16	1.00	.42
1986/87	271.00	100.00	0	0
1987/88	228.00	98.28	3.00	1.29
1988/89	262.00	98.50	4.00	1.50
1989/90	212.00	91.38	18.00	7.76
Average	233.00	96.72	7.27	3.02
Chicago:				
1979/80	300.00	95.85	9.00	2.88
1980/81	156.00	87.15	18.00	10.06
1981/82	152.00	99.35	0	0
1982/83	177.00	93.65	11.00	5.82
1983/84	236.00	90.77	18.00	6.92
1984/85	150.00	79.37	34.00	17.99
1985/86	158.00	88.76	9.00	5.06
1986/87	265.00	87.46	35.00	11.55
1987/88	305.00	90.50	16.00	4.75
1988/89	280.00	89.17	24.00	7.64
1989/90	237.00	70.96	95.00	28.44
Average	219.64	87.89	24.45	9.79
Los Angeles:				
1979/80	0	0	421.00	77.11
1980/81	2.00	.60	259.00	77.31
1981/82	0	0	295.00	81.27
1982/83	10.00	2.21	365.00	80.75
1983/84	13.00	2.58	397.00	78.93
1984/85	0	0	389.00	82.77
1985/86	0	0	552.00	91.09
1986/87	0	0	427.00	89.52
1987/88	0	0	339.00	89.21
1988/89	3.00	.93	280.00	86.96
1989/90	10.00	2.90	304.00	88.12
Average	3.45	.79	366.18	83.93
New York City:				
1979/80	819.00	78.15	167.00	15.94
1980/81	735.00	79.55	90.00	9.74
1981/82	606.00	71.63	233.00	27.54
1982/83	737.00	84.81	50.00	5.75
1983/84	823.00	79.67	78.00	7.55
1984/85	506.00	74.85	44.00	6.51
1985/86	580.00	70.99	83.00	10.16
1986/87	497.00	72.55	37.00	5.40
1987/88	616.00	88.63	13.00	1.87
1988/89	336.00	91.30	11.00	2.99
1989/90	314.00	71.36	126.00	28.64
Average	564.00	79.34	64.18	9.03

[1]December to April season.
Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Table 17--Cucumbers: Florida's and Mexico's shipments to and market shares at selected terminal markets[1]

City/year	Florida		Mexico	
	Quantity	Share	Quantity	Share
	10,000 pounds	*Percent*	*10,000 pounds*	*Percent*
Atlanta:				
1979/80	204.00	42.77	243.00	50.94
1980/81	226.00	55.94	160.00	39.60
1981/82	260.00	75.14	83.00	23.99
1982/83	217.00	59.78	145.00	39.94
1983/84	267.00	64.18	135.00	32.45
1984/85	358.00	67.67	168.00	31.76
1985/86	337.00	59.44	205.00	36.16
1986/87	331.00	56.20	220.00	37.35
1987/88	458.00	71.01	175.00	27.13
1988/89	373.00	61.75	188.00	31.13
1989/90	302.00	49.03	289.00	46.92
Average	303.00	59.99	182.82	36.20
Chicago:				
1979/80	219.00	31.34	830.00	62.07
1980/81	260.00	24.64	719.00	68.15
1981/82	235.00	31.71	478.00	64.51
1982/83	250.00	28.57	591.00	67.54
1983/84	321.00	30.78	672.00	64.43
1984/85	384.00	39.83	549.00	56.95
1985/86	272.00	30.12	615.00	68.11
1986/87	306.00	24.72	909.00	73.42
1987/88	299.00	25.89	831.00	71.95
1988/89	317.00	20.97	1,164.00	76.98
1989/90	474.00	32.83	898.00	62.19
Average	585.00	29.91	1,272.27	65.05
Los Angeles:				
1979/80	0	0	1,523.00	80.58
1980/81	7.00	.66	589.00	55.15
1981/82	0	0	692.00	61.84
1982/83	0	0	782.00	76.00
1983/84	15.00	.83	1,284.00	71.29
1984/85	267.00	14.19	1,381.00	73.42
1985/86	10.00	.42	2,119.00	88.44
1986/87	0	0	1,973.00	90.84
1987/88	0	0	2,027.00	91.60
1988/89	0	0	1,699.00	90.52
1989/90	18.00	.76	2,213.00	92.83
Average	28.82	1.60	1,480.18	82.11
New York City:				
1979/80	501.00	21.62	1,755.00	75.74
1980/81	949.00	31.71	1,896.00	63.35
1981/82	389.00	53.58	214.00	29.48
1982/83	692.00	32.35	1,146.00	53.58
1983/84	1,421.00	45.36	1,543.00	49.25
1984/85	900.00	44.96	830.00	41.46
1985/86	1,033.00	43.29	1,224.00	51.30
1986/87	961.00	54.26	730.00	41.22
1987/88	923.00	46.78	768.00	38.93
1988/89	431.00	34.40	733.00	58.50
1989/90	613.00	39.27	766.00	49.07
Average	801.18	39.60	1,055.00	52.15

[1]December to April season.
Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Table 18--Bell peppers: Florida's and Mexico's shipments to and market shares at selected terminal markets[1]

City/year	Florida		Mexico	
	Quantity	Share	Quantity	Share
	10,000 pounds	*Percent*	*10,000 pounds*	*Percent*
Atlanta:				
1979/80	193.00	73.11	61.00	23.11
1980/81	132.00	70.97	36.00	19.35
1981/82	128.00	62.75	60.00	29.41
1982/83	160.00	86.49	9.00	4.86
1983/84	128.00	62.14	74.00	35.92
1984/85	184.00	62.37	76.00	25.76
1985/86	270.00	81.33	61.00	18.37
1986/87	285.00	82.85	43.00	12.50
1987/88	282.00	81.27	57.00	16.43
1988/89	349.00	78.25	93.00	20.85
1989/90	285.00	59.38	191.00	39.79
Average	217.82	72.85	69.18	23.14
Chicago:				
1979/80	140.00	53.44	71.00	27.10
1980/81	279.00	49.64	172.00	30.60
1981/82	268.00	47.27	242.00	42.68
1982/83	333.00	52.94	248.00	39.43
1983/84	374.00	47.77	366.00	46.74
1984/85	316.00	41.09	419.00	54.49
1985/86	315.00	39.72	413.00	52.08
1986/87	589.00	53.21	478.00	43.18
1987/88	675.00	54.39	510.00	41.10
1988/89	865.00	61.48	500.00	35.54
1989/90	374.00	56.24	244.00	36.69
Average	411.64	51.24	333.00	41.70
Los Angeles:				
1979/80	0	0	1,247.00	89.14
1980/81	41.00	3.65	827.00	73.71
1981/82	39.00	2.95	1,126.00	85.24
1982/83	82.00	7.13	863.00	75.04
1983/84	83.00	6.44	1,025.00	79.52
1984/85	70.00	5.26	1,204.00	90.39
1985/86	118.00	6.86	1,436.00	83.44
1986/87	74.00	4.76	1,332.00	85.60
1987/88	101.00	5.73	1,556.00	88.26
1988/89	211.00	11.85	1,420.00	79.78
1989/90	302.00	15.78	1,378.00	72.00
Average	101.91	6.86	1,219.45	82.06
New York City:				
1979/80	1,325.00	67.16	587.00	29.75
1980/81	1,442.00	76.50	301.00	15.97
1981/82	422.00	76.73	11.00	2.00
1982/83	1,411.00	82.32	241.00	14.06
1983/84	1,765.00	75.36	493.00	21.05
1984/85	801.00	57.17	459.00	32.76
1985/86	985.00	76.83	280.00	21.84
1986/87	886.00	75.28	212.00	18.01
1987/88	1,942.00	80.82	319.00	13.28
1988/89	1,178.00	83.49	203.00	14.39
1989/90	911.00	68.24	403.00	30.19
Average	1,188.00	74.79	319.00	20.08

[1]December to April season.
Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Atlanta, and Chicago, but Mexico dominates the Los Angeles market. No visible trends are obvious from the data, which indicate that, although market share fluctuated, longrun changes in market share are not discernable from the data. The size of the market increased in all markets except for New York City.

Tomatoes

Market shares for tomatoes (table 19) also show Florida to be the dominant supplier in Atlanta, New York City, and Chicago, with Mexico dominating in Los Angeles. Florida increased its market share in all but the New York City market until the 1989/90 season, when the December 1989 freeze severely cut production of Florida tomatoes. The size of the market significantly increased in all markets except New York City.

The Florida Winter Fresh Vegetable Industry

The winter fresh vegetable industry has long been important for Florida agriculture. The following sections provide a background of the industry for better understanding the competition that exists with Mexico.

Vegetable Growing Areas

Florida winter fresh vegetables are primarily produced in the southern half of the State where adequate growing conditions generally prevail (fig. 15). The Florida Agricultural Statistics Service generally divides the southern part of Florida into five vegetable producing areas: west central, east central, southwest, Everglades, and southeast. The west central region (including the Plant City, Palmetto-Ruskin, and Wauchula growing areas) has historically produced green beans, cucumbers, eggplant, squash, bell peppers, and tomatoes. The same commodities are found in the southeast production area (Pompano and Homestead), but the southwest producing area (Immokalee) grows all but green beans. The east central area (Ft. Pierce) primarily produces tomatoes. The Everglades production area grows several types of vegetables, but only green beans compete with Mexico during the winter market period.

Florida has faced many problems in continuing its presence in the winter fresh vegetable industry. Availability and quality of water have been leading problems facing Florida growers. Competition for water with urban areas has complicated Florida growers' acquisition of irrigation water. Florida's burgeoning population has created more demands that

Figure 15
Major growing areas in Florida for winter fresh vegetables

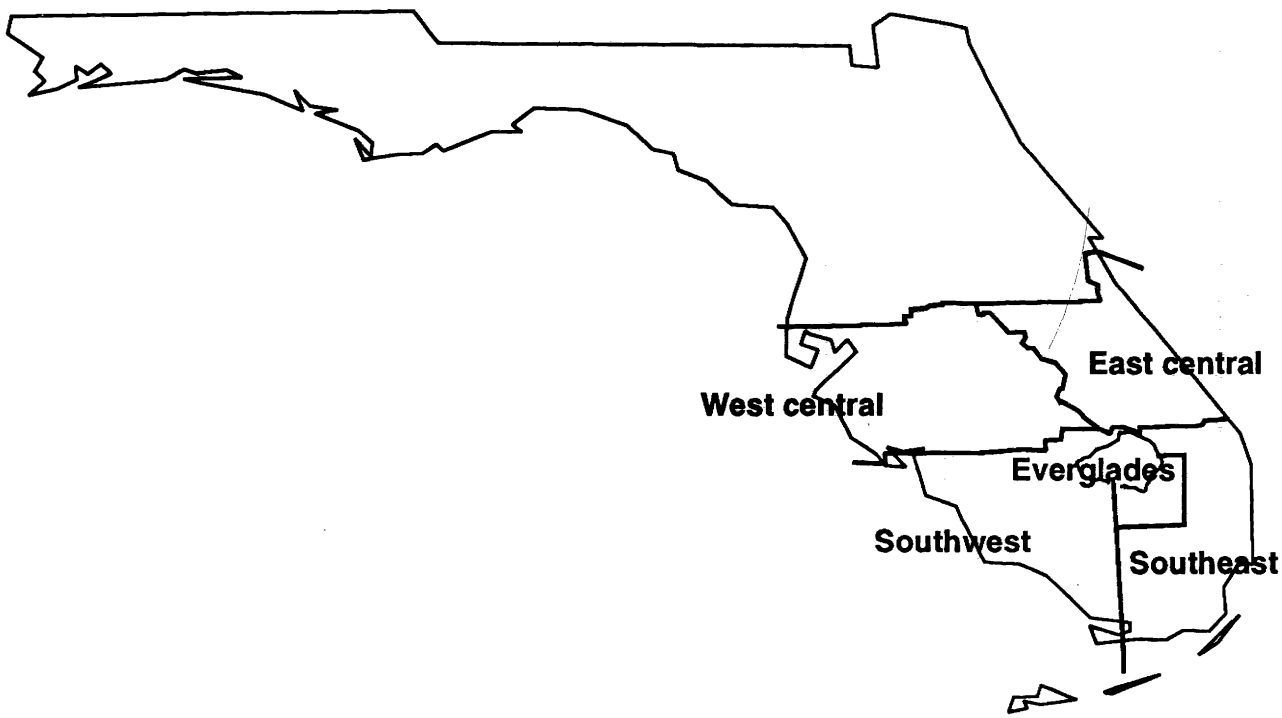


Table 19--Tomatoes: Florida's and Mexico's shipments to and market shares at selected terminal markets[1]

City/year	Florida		Mexico	
	Quantity	Share	Quantity	Share
	10,000 pounds	*Percent*	*10,000 pounds*	*Percent*
Atlanta:				
1979/80	1,128.00	76.53	344.00	23.34
1980/81	987.00	71.83	372.00	27.07
1981/82	1,139.00	79.93	280.00	19.65
1982/83	1,144.00	77.30	336.00	22.70
1983/84	1,102.00	67.15	520.00	31.69
1984/85	1,095.00	64.07	605.00	35.40
1985/86	1,359.00	66.85	650.00	31.97
1986/87	1,884.00	86.30	292.00	13.38
1987/88	1,742.00	84.24	304.00	14.70
1988/89	1,989.00	85.96	322.00	13.92
1989/90	1,509.00	66.98	727.00	32.27
Average	1,370.73	75.56	432.00	23.81
Chicago:				
1979/80	1,529.00	59.61	976.00	38.05
1980/81	1,709.00	62.76	923.00	33.90
1981/82	2,211.00	77.91	604.00	21.28
1982/83	1,930.00	65.85	986.00	33.64
1983/84	1,925.00	60.46	1,244.00	39.07
1984/85	1,696.00	59.99	1,089.00	38.52
1985/86	2,114.00	69.52	873.00	28.71
1986/87	2,909.00	66.34	1,457.00	33.23
1987/88	3,121.00	76.80	904.00	22.24
1988/89	2,817.00	74.54	817.00	21.62
1989/90	2,213.00	62.66	1,284.00	36.35
Average	2,197.64	67.40	1,014.27	31.10
Los Angeles:				
1979/80	970.00	12.42	5,518.00	70.64
1980/81	1,410.00	17.66	3,998.00	50.08
1981/82	1,502.00	17.53	4,668.00	54.49
1982/83	1,365.00	17.62	5,283.00	68.19
1983/84	848.00	11.93	5,489.00	77.20
1984/85	1,467.00	19.26	5,607.00	73.60
1985/86	1,319.00	14.08	7,577.00	80.90
1986/87	2,081.00	22.31	7,000.00	75.04
1987/88	2,430.00	31.76	5,082.00	66.43
1988/89	6,294.00	58.16	4,395.00	40.62
1989/90	3,579.00	38.73	5,478.00	59.28
Average	1,978.45	25.70	5,038.82	65.46
New York City:				
1979/80	5,113.00	88.19	567.00	9.78
1980/81	4,535.00	79.49	1,055.00	18.49
1981/82	4,190.00	88.77	420.00	8.90
1982/83	3,569.00	84.67	507.00	12.03
1983/84	3,344.00	70.92	699.00	14.83
1984/85	3,683.00	78.65	578.00	12.34
1985/86	3,910.00	73.75	722.00	13.62
1986/87	3,665.00	74.21	799.00	15.77
1987/88	3,867.00	79.06	807.00	16.50
1988/89	3,056.00	89.67	317.00	9.30
1989/90	2,244.00	70.46	887.00	27.85
Average	3,743.27	79.86	667.09	14.23

[1]December to April season.
Source: U.S. Department of Agriculture, Agricultural Marketing Service.

compete with Florida produce growers. Increased demand for water has also been accompanied by greater concerns for water quality. Use of chemicals in the production process has led to more restrictions on chemical and water use because of the potential effect their use may have on water quality for other users. Critical chemicals used for efficiently producing many vegetables have been threatened or withdrawn from the market because of the health and environmental risks associated with their use or because of the lengthy and expensive process required for approval by the Food and Drug Administration (FDA). Water quality regulations have also been felt at the packing shed where regulations have been introduced to control the disposal of dump tank water used to clean produce as it is brought from the field.

Land availability has also become more restricted in recent years. Regulations concerning wetlands and endangered species have complicated growers' use of land for growing vegetables. These factors and the growing urbanization of Florida agricultural areas have created increasing pressure on farmland availability. Growers in many cases have had to move their operations.

Labor availability has also been more restricted in recent years. Federal regulations implementing the Immigration Reform and Control Act (IRCA) of 1986 have been introduced to control the use of illegal workers in the fields. Growers are responsible for monitoring the status of workers to assure they meet Federal guidelines for work. Those growers violating the employment practices are subject to civil and criminal penalties.

Accompanying these problems are increased regulatory activities requiring growers and shippers to record activities that may affect water, labor, or land resources. Examples of increased regulatory activities include Workers Right To Know regulations that require growers to train workers about the hazards of working around hazardous materials, to monitor the use of hazardous materials, and to make workers aware of hazardous materials used in their work domain. Emergency planning guidelines have also been enacted requiring growers to register with local, State, and Federal officials regarding the storage of hazardous materials on their premises. These materials include pesticides and fertilizers commonly used in the production of fresh vegetables. These regulations are just a few examples of the increased regulatory environment growers and shippers are facing in the produce industry in Florida. These regulations result in larger overhead costs to assure compliance and often require development of new production practices as new regulations are enacted, raising the costs for growers to continue in the produce business.

Despite these increasing regulations affecting vegetable production, land devoted to production has decreased only slightly over the last 15 years (3.8 percent). Land devoted to vegetable production was 283,350 acres in 1976/77, compared with 272,430 acres in 1990/91 (table 20). The most land devoted to vegetables in this period was 324,950 acres in 1978/79. Acreage devoted to vegetables decreased gradually over the years to the lowest point of 272,380 acres in 1989/90. Of the six crops included in this study, land planted in fresh market green beans decreased from 50,800 acres in 1980/81 to 22,550 acres in 1990/91. Cucumber acreage remained fairly steady over the period at around 16,000 acres until 1989/90 when it dropped below 15,000 acres. Eggplant acreage decreased from 3,100 acres in 1980/81 to 2,050 acres in 1990/91. Green peppers acreage has fluctuated from 18,700 acres to 23,100 acres with no real trend. Squash acreage declined from 17,700 acres in 1984/85 to 12,500 acres in 1990/91. Tomatoes acreage steadily increased from 41,300 acres in 1981/82 to 62,500 acres in 1988/89 but declined to 50,500 acres in 1990/91.

Types and Relationships of Growers and Shippers

Tomatoes, the highest value vegetable crop in Florida, are produced by approximately 200 growers in the regulated area of the Federal Marketing Order for tomatoes. These growers typically establish a relationship with one of more than 80 registered tomato handlers. These packers typically contract with growers to handle, pack, ship, and sell their tomatoes in the national marketing system. Although the size of packer varies, most packers handle tomatoes for several growers in their area. Many of these registered handlers are repackers of tomatoes or handle small amounts. An estimated 30 packers handle 97 percent of the product sold in the national marketing system. Handlers work with the growers in planning their production and in solving problems they may have during the production season.

Packers for other crops do not vary in any large measure from tomato packers except that they typically are not as large as tomato packer/shippers. Pepper growers often have their own sheds for packing and shipping bell peppers to the wholesale markets or they pack in the fields using mobile packing sheds. These packers typically contract with brokers to sell their peppers in the national marketing chain. Al-

Table 20–Vegetable acreage in Florida

Crop year	Vegetables	Green beans	Cucumbers	Eggplant	Squash	Green peppers	Tomatoes
				Planted acres			
1976/77	283,350	51,500	16,100	2,250	12,600	21,100	43,200
1977/78	318,400	54,000	16,500	2,400	12,350	20,400	42,100
1978/79	324,950	60,800	16,600	3,100	13,850	19,800	41,300
1979/80	324,800	56,900	15,400	3,100	14,000	18,700	42,900
1980/81	315,500	50,800	15,800	3,100	15,600	20,400	47,000
1981/82	304,470	52,600	16,100	2,640	17,400	21,500	41,300
1982/83	318,190	49,350	15,900	2,590	16,700	21,400	45,600
1983/84	317,390	48,900	16,000	2,300	17,700	23,000	49,300
1984/85	320,780	49,600	16,800	2,680	17,700	22,700	49,400
1985/86	312,300	39,800	17,900	2,500	16,700	21,100	48,700
1986/87	309,625	35,350	17,200	2,400	16,100	20,100	53,600
1987/88	313,800	31,350	15,600	2,200	14,700	21,500	57,000
1988/89	306,750	30,400	15,250	2,100	15,200	21,900	62,500
1989/90	272,380	26,500	14,700	2,050	13,600	23,100	55,800
1990/91	272,430	22,550	14,550	2,050	12,500	20,700	50,500

Source: Florida Agricultural Statistics Service, 1992.

though bell pepper packer/shippers are not required to register their packing sheds, industry estimates indicate there are about 25 packers of fresh peppers in Florida operating at any one time, with a total of 60 to 70 shippers in the southern and central parts of the State. These packers will handle other types of produce to develop "mixer" loads of two or more vegetables for produce buyers. As such, packers may buy directly from the growers of these vegetables or simply charge handling and selling fees for the services they provide.

Other vegetables sold in Florida are often handled similarly to bell peppers. Grower/packers may pack and ship their own produce and vegetables for other growers. Industry sources estimate that 25 packer/shippers of each vegetable operate in south Florida at any one time during the winter market season with a total of 60 to 70 total shippers in the State. The exception to this number is green beans which are handled by 15 major packer/shippers in the winter market.

Production and Trade Associations

Several organizations represent the Florida vegetable industry, including the Florida Fruit and Vegetable Association (FFVA), Florida Farm Bureau, Florida Tomato Committee, Florida Tomato Exchange, Florida Tomato Growers Exchange, and Florida Pepper Exchange. The FFVA is a cooperative association of growers, shippers, packers, and processors that sponsors several programs for the industry. These programs include labor programs to minimize seasonal labor shortages and to assist growers in programs to maintain a legal workforce, marketing programs to help interested groups develop cooperative marketing programs, and production assistance programs to help growers with occasional production problems. FFVA is also involved in State, national, and international policy discussions that affect the fruit and vegetable industry, keeping producers and shippers aware of policies that may affect them and lobbying policymakers on issues that may affect members of their organization.

The Florida Farm Bureau is a cooperative organization of all types of growers of food and fiber whose major role in the vegetable industry is in providing support in legislative activities that may affect the fruit and vegetable industry.

The Florida Tomato Committee is a growers' committee that governs the activities of Federal Marketing Order No. 966 for tomatoes. This marketing order covers the majority of tomatoes grown in Florida and all tomatoes imported during the regulated season of the marketing order, roughly October to June of each season. The Committee recommends to policymakers regulations that must be adhered to for all tomatoes

grown in south and central Florida. Tomatoes imported into the United States during the regulated season must also adhere to the minimum size and grade regulations. The Committee recommends size, grade, container, pack, and inspection requirements for tomatoes. In 1986, the marketing order was amended to include the responsibility for production research and tomato education and promotion programs. These programs had previously been managed by the Florida Tomato Exchange. The University of Florida received $134,000 in 1990/91 for production research. Another $82,500 was committed along with funds from the FFVA for research to obtain Department of Environmental Regulation permits for discharge of tomato dump tank waste water.

The Florida Tomato Exchange, a statewide cooperative of first handlers of Florida fresh tomatoes, provides collective action for orderly marketing and distribution of Florida fresh tomatoes. Many of the programs provided by the Florida Tomato Exchange are those that are not permitted in the marketing order governing committee. The major activities of the Florida Tomato Exchange include lobbying efforts and retaining legal aid for assistance on items affecting the tomato industry. The basic public relations program also remains under the guidance of this exchange.

The Florida Tomato Growers Exchange was organized in 1989 as a cooperative of growers in central and south Florida to provide collective action for orderly marketing and distribution of fresh tomatoes. Growers of tomatoes who produce more than 90 percent of the total volume in central and south Florida joined the exchange. Glut conditions in the spring of 1990 encouraged the exchange to try minimum prices and shipping holidays. These programs led several members to resign from the exchange. The exchange was reorganized in 1990 and, after agreeing to limit its activities with regard to marketing and membership, again reached 85 percent of the total production in central and south Florida.

The Florida Bell Pepper Growers Exchange is a grower cooperative organized to assist pepper growers with marketing problems and to provide forums for exchange of information on producing and marketing of Florida peppers. It also funds a small amount of research. The Florida Bell Pepper Growers Exchange, as are many grower exchanges for fruit and vegetables grown in Florida, was assisted in organizing and now in management by the FFVA.

Marketing Channels

Florida fresh vegetables generally move directly from the field to the packing shed for packing and distribution. Some vegetables, such as some bell peppers, are field packed and moved to the packing shed for precooling and storage before shipment to wholesale markets. Packing plants usually accommodate several growers.

Vegetables are generally moved to wholesale and terminal markets by truck. Rail transportation is used for some vegetables moved long distances, but has declined over the last several years. Terminal and wholesale markets handle and deliver vegetables from warehouse storage facilities to retail and institutional outlets.

Figure 16 depicts the marketing channel for U.S. fresh vegetables from grower to consumer. Repackers are wholesalers who generally regrade and repack produce in destination markets. Tomatoes are one of the leading vegetables that are repacked to meet the specific needs of retailers and institutional trade in consuming markets.

Most vegetables are sold over the telephone by contractual agreements between shipping point operators and wholesale buyers in consuming markets. These agreements facilitate shipping logistics and help assure markets for highly perishable vegetables. Market integrity is maintained by long established trading customs, trade ethics, and trade laws, such as the Perishable Agricultural Commodities Act (PACA).

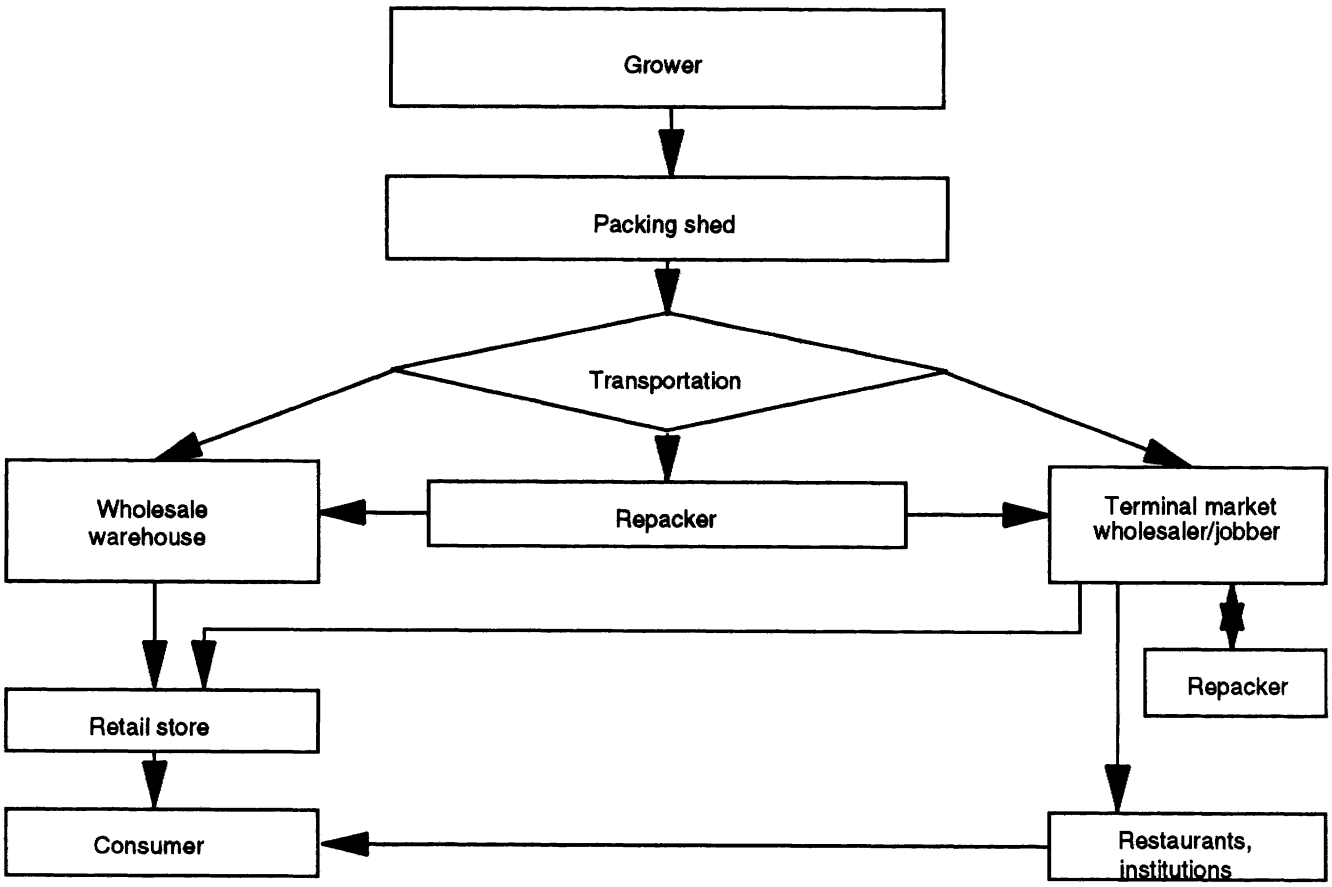
Trends in Production

While Florida has experienced a growing array of problems in the winter fresh vegetable industry, some crops have grown in importance, while others have decreased in importance. The following discusses changes in production practices and the trends in production in Florida for the vegetables considered in this study.

Tomatoes

Tomato production in Florida tends to be volatile. Planted acreage increased from about 47,000 acres in 1980/81 to 50,500 acres in 1990/91 (table 21). Yields per acre increased slightly to 1,239 cartons per acre during that time. Price per 25-pound carton increased from $5.49 to $9.23 (table 22). A major freeze in late

Figure 16
Marketing channels for U.S. fresh vegetables from grower to consumer



Source: Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez (1986).

Table 21–Tomatoes: Acreage, yield, and production, Florida

Crop year	Planted	Acreage harvested	Yield per acre				Production	
			Fresh and processed	Fresh	Processed	Total	Fresh	Processed
	Acres		*Cartons*				*1,000 cartons*	
1980/81	47,000	46,300	1,043	1,003	40	48,272	46,432	1,840
1981/82	41,300	40,500	1,293	1,250	43	52,360	50,632	1,728
1982/83	45,600	45,600	1,186	1,154	32	54,080	52,640	1,440
1983/84	49,300	47,600	1,157	1,128	29	55,056	53,712	1,344
1984/85	49,400	47,400	1,250	1,223	27	59,224	57,976	1,248
1985/86	48,700	48,200	1,267	1,243	24	61,056	59,904	1,152
1986/87	53,600	53,300	1,259	1,241	18	67,083	66,123	960
1987/88	57,000	56,800	1,362	1,344	19	77,389	76,333	1,056
1988/89	62,500	60,700	1,225	1,207	17	74,344	73,288	1,056
1989/90	55,800	51,600	1,184	1,169	15	61,114	60,336	778
1990/91	50,500	50,400	1,256	1,239	17	63,310	62,430	880

Source: Florida Agricultural Statistics Service, 1992.

Table 22–Tomatoes: Production and value, Florida

Crop year	Total	Production		Value per carton		Total value
		Fresh	Processed	Fresh	Processed	
	1,000 cartons			*Dollars*		*1,000 dollars*
1980/81	48,272	46,432	1,840	5.49	1.00	256,584
1981/82	52,360	50,632	1,728	5.23	.94	266,306
1982/83	54,080	52,640	1,440	7.39	.94	390,612
1983/84	55,056	53,712	1,344	6.83	.95	367,955
1984/85	59,224	57,976	1,248	5.74	.94	334,091
1985/86	61,056	59,904	1,152	7.62	.94	457,823
1986/87	67,083	66,123	960	7.78	.98	515,685
1987/88	77,389	76,333	1,056	7.00	.96	535,489
1988/89	74,344	73,288	1,056	9.37	.96	687,900
1989/90	61,114	60,336	778	7.29	.96	440,434
1990/91	63,310	62,430	880	9.23	.93	577,258

Source: Florida Agricultural Statistics Service, 1992.

1989 destroyed many acres of tomatoes, and resulting high prices weakened market demand for growers who rushed to replant immediately after the freeze. Growers left over 5.2 million cartons in their fields due to low spring prices in 1990. Growers substantially reduced their planted acreage for 1990/91 and 1991/92, especially in the Homestead area (from 11,000 to 6,000 acres). On the other hand, land from which tomatoes were harvested in Collier County increased from 13,700 acres to 17,490 acres during 1986/87-1990/91 (table 23).

Tomato yields have greatly increased since 1980 due to the use of hybrid cultivars and improved management practices. Sunny is the predominate variety of tomatoes planted in all areas except Dade County where Bonita was the dominant variety in 1990/91. Extensive use of plastic mulch, stakes, and transplants have also increased yields. Many growers are using drip irrigation and apply fertilizer via this irrigation method. Tomato producers in Homestead started using stakes and transplants in 1987/88 and made almost a complete switch to these production practices by 1988/89.

The major problems facing the industry today relate to whitefly and Gemini virus and to thrips and tomato spotted wilt virus. The latter problem has mostly been observed in north Florida, but whiteflies have appeared everywhere. The concentration of the insects and diseases are worse in the fall crop, regardless of location.

Bell Peppers

Several bell pepper production practices have changed since the mid-1980's. These changes include a greater shift to the use of hybrid cultivars, the greater use of transplants, the use of cultivars grown for color other than green (red, yellow, orange, brown), and an increasing but still limited use of drip irrigation. Yields have increased from 435 bushels/acre in 1980/81 to over 718 in 1990/91 (table 24). This increase in production is most related to the use of hybrid cultivars and transplants for better stand establishment. Palm Beach County has been the major production area for bell peppers in Florida, but the harvested acreage declined more than 20 percent during 1983/84-1990/91 (table 25). This reduction was mostly due to higher land values acreage shifted to Collier County (part of southwest Florida) which now has the greatest acreage of bell peppers at 5,400 acres. Acreage in southwest Florida increased from 8,110 to 8,950 acres during our study years, peaking at 9,900 acres in 1988/89. By contrast, acreage in southeast Florida increased from 3,680 acres in 1980/81 to 6,800 acres in 1983/84, but then declined to 5,200 acres in 1990/91.

Cucumbers

Acreage of fresh market cucumbers decreased slightly (less than 7 percent) after 1980/81, while the acreage of pickling cucumbers declined from 5,000 acres to 1,800 acres (tables 26 and 27). Most of this pickling

Table 23--Ground and staked tomatoes: Acres harvested, selected Florida counties

County/ planting method	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
						Acres					
Dade:											
Ground	13,000	10,900	12,900	12,800	11,200	11,600	11,150	7,950	660	50	50
Staked	*	*	*	*	*	*	*	1,200	7,340	5,750	5,550
Collier/ Hendry:											
Ground	1,960	1,125	1,620	1,110	780	1,300	800	420	270	50	0
Staked	9,700	8,465	7,860	8,625	9,390	9,680	12,900	16,400	18,250	16,250	17,490
Manatee/ Hillsborough:											
Staked	15,630	14,385	16,250	17,540	16,400	19,100	20,850	22,900	17,700	14,095	17,700
Palm Beach:											
Staked	2,285	1,920	2,430	3,150	3,000	3,420	4,100	4,360	3,410	3,175	3,650
Other ground and staked	3,725	3,705	4,540	4,375	6,630	3,100	3,500	3,570	13,070	12,230	5,960
Total ground	15,400	12,540	12,910	13,950	12,540	13,300	12,550	8,370	930	110	50
Total staked	30,900	27,960	32,690	33,650	34,860	34,900	40,750	48,430	59,770	51,490	50,350
State total	46,300	40,500	45,600	47,600	47,400	48,200	53,300	56,800	60,700	51,600	50,400

*In Dade County, staked tomatoes were included with ground tomatoes before 1987/88.
Source: Florida Agricultural Statistics Service, various issues.

Table 24--Green peppers: Acreage, yield, production, and value, Florida

Crop year	Land		Yield/acre	Production	Value per bushel	Total value
	Planted	Harvested				
	----------*Acres*----------		*Bushels*	*1,000 bushels*	*Dollars*	*1,000 dollars*
1980/81	20,400	18,300	435	7,968	8.10	64,516
1981/82	21,500	19,300	412	7,944	7.00	55,592
1982/83	21,400	19,700	482	9,492	9.45	89,687
1983/84	23,000	20,700	467	9,660	7.75	74,833
1984/85	22,700	20,800	507	10,540	6.59	69,460
1985/86	21,100	19,200	586	11,250	6.83	76,786
1986/87	20,100	18,500	617	11,423	12.00	137,033
1987/88	21,500	20,400	649	13,232	7.03	93,044
1988/89	21,900	20,900	673	14,068	7.83	110,181
1989/90	23,100	20,200	655	13,235	8.41	111,246
1990/91	20,700	20,000	718	14,358	12.09	173,628

Source: Florida Agricultural Statistics Service, 1992.

Table 25--Green peppers: Acres harvested, selected Florida counties

County	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
						Acres					
Palm Beach/ Broward[1]	3,680	4,330	5,850	6,800	6,400	6,250	5,850	5,500	4,200	4,350	5,200
Collier/Hendry/ Lee/Charlotte[2]	8,110	6,020	7,350	6,450	6,100	5,950	7,200	8,300	9,900	9,300	8,950
Other	6,510	6,950	6,500	7,450	8,300	7,000	5,450	6,600	6,800	6,550	5,850
State total	16,300	19,300	19,700	20,700	20,800	19,200	18,500	20,400	20,900	20,200	20,000

[1] Broward included in other counties in 1988/89-1990/91.
[2] Charlotte included in other countries in 1987/88-1990/91.
Source: Florida Agricultural Statistics Service, various issues.

Table 26--Cucumbers: Harvested acreage and yield, Florida

Crop year	Harvested cropland			Yield		
	Total	Fresh	Processed	Total	Fresh	Processed
	Acres			*Bushels/acre*		
1980/81	19,900	14,900	5,000	241	273	145
1981/82	n.a.	15,300	n.a.	n.a.	308	n.a.
1982/83	n.a.	15,000	n.a.	n.a.	316	n.a.
1983/84	19,800	15,100	4,700	273	307	164
1984/85	20,900	16,100	4,800	293	326	182
1985/86	21,300	16,900	4,400	287	310	200
1986/87	20,000	16,100	3,900	304	324	218
1987/88	20,850	14,850	6,000	337	385	218
1988/89	16,600	13,900	2,700	408	450	193
1989/90	16,100	13,700	2,400	427	464	215
1990/91	15,750	13,950	1,800	475	504	254

n.a. = Not available.
Source: Florida Agricultural Statistics Service, various issues.

Table 27--Cucumbers: Production and value, Florida

Crop year	Production		Value per bushel		Total value	
	Fresh	Processed	Fresh	Processed	Fresh	Processed
	1,000 bushels		*Dollars*		*1,000 dollars*	
1980/81	4,072	727	8.85	8.09	36,054	5,880
1981/82	4,707	n.a.	7.00	n.a.	32,970	n.a.
1982/83	4,742	n.a.	7.77	n.a.	36,851	n.a.
1983/84	4,635	769	7.33	8.28	33,971	6,366
1984/85	5,242	873	7.13	7.56	37,353	6,600
1985/86	5,239	880	6.86	7.65	35,920	6,728
1986/87	5,224	851	9.37	8.69	48,974	7,394
1987/88	5,717	1,309	9.58	8.25	54,778	10,800
1988/89	6,255	521	9.89	10.02	51,837	5,223
1989/90	6,362	516	9.73	10.43	61,873	5,381
1990/91	7,030	458	11.16	11.28	78,489	5,166

n.a. = Not available.
Source: Florida Agricultural Statistics Service, various issues.

cucumber acreage was lost from the Seminole County area around Sanford. Although Seminole County had the greatest concentration of pickling cucumber acres in 1990/91, no pickle growers remain today. The county's last grower moved to south Florida in early 1992. Yields of fresh market cucumbers increased dramatically from 273 bushels per acre in 1980/81 to more than 500 bushels per acre 10 years later. This increase in production can be attributed to the complete switch to hybrid cultivars, a broader use of plastic mulch (mostly in a double-cropping system), and better production management practices (including better care in using bees for pollination). Drip irrigation is used on some of the crops, generally in a double crop situation. Double cropping has become the major production practice for fresh market cucumbers in southwest Florida. Palm Beach County remains the leader in cucumber production, followed by Lee, Manatee, Hendry, and Collier Counties.

Eggplant

Eggplant acreage, location, and production practices remained similar during our study years (table 28). Average yields increased on the 2,000 or so acres from about 600 bushels per acre in 1980/81 to over 800 bushels per acre in 1990/91. The use of newer cultivars and more intense and well-managed production operations were responsible for the increase. The average value per bushel of eggplant increased considerably from a low of $4.30 in 1984/85 to over $8.50 per bushel in 1989/90. Palm Beach County continues to lead in the production of eggplant with over 800 acres in 1990/91.

Squash

Total squash acreage decreased 20 percent from 15,600 acres in 1980/81 to 12,500 acres in 1990/91 (table 29). Squash yields significantly increased from

Table 28--Eggplant: Acreage, production, and value, Florida

Crop year	Cropland		Yield	Production	Value per bushel	Total value
	Planted	Harvested				
	----------Acres----------		*Bushels*	*1,000 bushels*	*Dollars*	*1,000 dollars*
1980/81	3,100	2,800	592	1,658	5.67	9,394
1981/82	2,640	2,530	657	1,661	5.76	9,568
1982/83	2,590	2,500	666	1,666	5.0	68,429
1983/84	2,300	2,100	710	1,491	5.8	48,713
1984/85	2,680	2,500	658	1,646	4.30	7,075
1985/86	2,500	2,350	675	1,586	5.73	9,093
1986/87	2,400	2,300	689	1,585	6.08	9,634
1987/88	2,200	2,100	668	1,403	7.31	10,253
1988/89	2,100	2,000	810	1,619	7.05	11,413
1989/90	2,050	1,950	815	1,589	8.52	3,537
1990/91	2,050	1,950	806	1,571	8.26	12,974

Source: Florida Agricultural Statistics Service, various issues.

Table 29--Squash: Acreage, production, and value, Florida

Crop year	Cropland		Yield	Production	Value per bushel	Total value
	Planted	Harvested				
	----------Acres----------		*Bushels*	*1,000 bushels*	*Dollars*	*1,000 dollars*
1980/81	15,600	14,800	159	2,357	9.72	22,904
1981/82	17,400	16,600	168	2,788	9.69	27,029
1982/83	16,700	16,100	179	2,874	11.12	31,949
1983/84	17,700	16,800	177	2,981	10.12	30,173
1984/85	17,700	16,500	172	2,829	11.00	31,119
1985/86	16,700	15,800	202	3,192	12.60	40,219
1986/87	16,100	15,200	198	3,010	12.30	37,023
1987/88	14,700	14,000	243	3,402	11.80	40,144
1988/89	15,200	13,650	277	3,785	9.50	35,958
1989/90	13,600	11,700	340	3,978	9.20	36,598
1990/91	12,500	11,800	320	3,776	13.30	50,221

Source: Florida Agricultural Statistics Service, various issues.

about 160 bushels per acre in 1980/81 to over 340 bushels per acre in 1989/90. This increase in production is due almost exclusively to the use of hybrid cultivars, the common use of plastic mulch, and generally better managed production units. Areas of production in Florida did not shift over our study years. Dade County continues to lead in production with about 30 percent of the total acres planted.

The Mexican Winter Fresh Vegetable Industry

Vegetable Growing Areas

The Mexico winter fresh vegetable industry provides important foreign exchange and employment in Mexico. The following sections provide a background of the industry for the purpose of better understanding the competition Mexican growers provide in the winter fresh vegetable market.

There are three principal growing areas in Sinaloa: Culiacan, Guasave, and Los Mochis. The Culiacan Valley, however, accounts for the largest portion of export vegetable production (fig. 17). Tomatoes of all types, cucumbers, peppers, and eggplant are grown in the Culiacan Valley. In the Guasave area, tomato, squash, beans, cucumbers, and peppers are cultivated. In Los Mochis, green beans, squash, peppers, and late-season tomatoes predominate. Sinaloa vegetable production has primarily been exported to the United States, but an emerging domestic market is taking some of the current production.

Water, land, and labor do not seriously constrain export vegetable production. All the major rivers in Sinaloa have reservoirs with irrigation canal systems. Despite occasional shortages of irrigation water in the late 1980's, vegetables have always received top priority over field crops for irrigation water. A few of the more innovative growers are experimenting with drip irrigation, more as a means for controlling water, fertilizer, and chemical applications than for conserving water.

Chemical use has not posed as many problems to Mexican growers as it has to U.S. growers. While exports must follow the same regulations for chemical use as in the United States, monitoring the use of these chemicals occurs almost entirely with the U.S. Food and Drug Administration inspections at the U.S. border. Exports are randomly sampled for residues of illegal chemicals, and violators lose their right to ship into U.S. markets for parts of the season. However, no Mexican agency effectively monitors the use of chemicals at the farm level, leaving the responsibility of proper use to the growers themselves. The majority of the vegetable land in Sinaloa is privately owned

Figure 17
Major growing areas in Sinaloa, Mexico, for winter fresh vegetables

even though occasional land swaps between ejidos (land reform units) and private owners on adjacent fields occur when crop rotation makes these arrangements convenient. Leasing and sale of ejido lands throughout Mexico may be facilitated by the reform of the ejido sector. The Salinas de Gortari administration has not used the term "privatization" for this reform, but one plank of the reform grants individual ejidatarios the right to sell or lease "parcelized" property.

Export vegetables are labor-intensive crops requiring readily available field workers. As many as 150,000 seasonal laborers migrate to the Culiacan Valley annually for cultivating and harvesting vegetables. Many growers recruit field workers from neighboring States as well as from as far away as Michoacan and Oaxaca. Most larger growers pay transportation for these migrant workers and provide housing of varying quality. Migrant workers generally spend at least 4 months during the harvest season in Sinaloa before returning to their homes. A few large growers send work crews to Baja California once the season in Sinaloa ends. Local workers prefer washing, sorting, and packing jobs in packing sheds to field work.

Some growers complain that field workers are not as productive in Mexico as they are in the United States. However, growers seldom pay field workers piece rates, stating that workers damage the produce if they work too fast. Growers occasionally pay piece rate or offer bonuses, but daily wage rates appear to be the most common way of paying field laborers. In real terms, daily wages have not increased substantially, although some growers would argue that real wages per unit of output have increased due to a less productive labor force than in previous years.

Daily farm wages in Sinaloa, denominated in U.S. dollars, rose steadily in the late 1980's. But nominal daily wages during the 1990/91 season were comparable to daily wages during the mid-1970's. Anecdotal evidence suggests, however, that current low wage rates are offset partially by productivity per worker that is lower than in previous years.

Seasonality of Fresh Vegetable Imports

The seasonal pattern of imports of fresh tomatoes from Mexico has shifted during the last decade. Until the 1980's, the bulk of imports occurred from February through April. Although imports in March have remained roughly constant, import volumes in April and May have declined in recent years, with offsetting increases during January and February. This changing seasonal pattern of fresh tomato imports implies more direct competition with producers in Dade County, southeast, and southwest Florida and less competition with west central Florida growers.

Seasonal shipments of tomatoes from Sinaloa depend upon numerous factors: the cycle of plantings in the Culiacan area, acreage planted in the Los Mochis area, and growers' expectations regarding seasonal price fluctuations. In recent seasons, Culiacan growers have generally scheduled three plantings: early, September to mid-October; midseason, mid-October to November 10; and late season, after November 10. Yields on early and midseason plantings in the Culiacan area are ordinarily better than on late season plantings. Higher temperatures and humidity during the late season tend to stress plants. Some growers also comment that their expectation of sizable increases in production from Florida in April and May (and corresponding lower prices) have led them to plant fewer late-season tomatoes. Tomatoes grown in the Los Mochis area generally come onto the market later in the season. Although no exact figures on area planted in Los Mochis are available, the expectation of lower prices in the later part of the season has probably lead to lower production in the Los Mochis area.

Trends in the Composition of Fresh Vegetable Imports

Although all six fresh vegetables considered in this study are important exports for Mexico, fresh tomatoes account for the majority of Mexican production and value (table 30). Although the area planted in fresh vegetables increased from 66,850 acres in 1980/81 to 99,890 acres in 1990/91, tomato acreage declined from about 55 percent of total vegetable acreage in 1980/81 to around 40 percent in the mid-1980's. During the same period, area planted in cucumbers and, to a lesser extent, squash increased. However, during 1989/90 and 1990/91, tomato plantings increased and other crops declined.

The relative increase in tomato acreage and production in recent years is accounted for by higher production of mature green tomatoes and other types of tomatoes, such as Roma and cherry tomatoes. During 1986/87-90/91, mature green plantings increased fourfold to nearly 7,500 acres. During our study years, the percentage of mature green tomatoes shipped from Sinaloa increased from about 10 percent to about 30 percent of all fresh tomato shipments. Increased production of mature green, Roma, and cherry tomatoes apparently represents a move within the industry to diversify production away from sole reliance on vine-ripe red tomatoes.

Table 30--Acres planted to vegetable crops in Sinaloa, Mexico

Year	Tomatoes[1]			Bell peppers	Cucumbers	Squash	Eggplant	Green beans	Total for all commodities
	All types	Stake	Ground						
					Acres				
1980/81	36,492	22,531	10,769	6,798	12,390	6,212	1,401	3,558	66,850
1981/82	34,312	21,500	9,998	6,605	10,074	7,260	1,344	2,276	61,871
1982/83	41,075	26,032	10,415	9,019	17,129	9,155	1,784	3,501	81,664
1983/84	45,536	29,247	8,609	13,526	24,394	10,912	2,231	4,764	101,363
1984/85	43,450	31,112	5,898	14,386	20,539	10,324	1,670	4,295	94,664
1985/86	41,453	31,594	4,047	12,926	15,814	7,104	2,076	3,205	82,578
1986/87	51,014	36,237	1,717	16,328	18,738	11,663	1,824	5,500	105,067
1987/88	47,987	32,664	798	15,266	19,709	15,076	2,424	6,820	107,281
1988/89	50,342	28,683	4,230	13,541	19,276	17,463	2,661	7,971	111,254
1989/90	63,846	29,991	6,412	11,322	17,559	10,979	1,201	3,726	108,633
1990/91	55,027	29,286	7,428	12,619	15,651	9,135	2,157	5,300	99,890

[1] Beginning in 1986/87, stake and ground categories for tomatoes were replaced with vine-ripe and mature green, respectively.
Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues.

Trends in Mexican Domestic Market

The Mexican domestic market has traditionally been a residual market for export vegetables from Sinaloa. Although this domestic market still represents a residual market, the relative size of the Mexican domestic market has grown, particularly for tomatoes and bell peppers.

The major urban areas for the national market are Mexico City, Guadalajara, Monterrey, and Torreon. About 60 percent of that volume is shipped to Mexico City, 25 percent to Guadalajara, and the remaining 15 percent to the other two markets. Tomatoes account for nearly 90 percent of the products sold in the domestic market. Mexican consumers prefer Roma tomatoes for use in preparing sauces. Other types of tomatoes are used on a limited basis for salads. Other vegetables shipped from Sinaloa to the national market on a limited basis are cucumbers, squash, and bell peppers. Eggplant is not consumed in any significant volume in Mexico.

Although most large growers continue to produce almost exclusively for the export market, the domestic market is apparently becoming a more important market as prices improve, quality of produce demanded improves, and the size of these markets grows. The entry of high-quality U.S. produce to these urban markets since 1988/89 apparently affected the standards by which wholesalers and consumers judge produce quality. In the past, most domestically marketed produce was of inferior quality that could not be marketed in the United States because it did not meet U.S. import or Mexican export standards. Today, much of the produce marketed domestically is equal in quality to that shipped to the United States.

Growing per capita incomes and urban populations suggest that the four major urban domestic markets will become increasingly important as a source of demand for export-quality produce from Sinaloa. As direct foreign investment in Mexico has increased, a number of U.S. and European companies have also formed joint ventures with Mexican counterparts to establish large supermarket chains in these urban areas. These large chains will probably facilitate the marketing of more standardized, higher quality produce as investment is made in adequate storage and handling facilities. However, the Mexican market does not significantly compete with the export market. Growth in the domestic market will most likely be met from increased production, rather than from a reduction in export production.

Types and Relationships of Growers and Shippers

Most growers in Sinaloa are private landholders who form groups to organize production and marketing. Because of constraints imposed by land reform laws, an individual could not cultivate more than 100 hectares (247 acres) of irrigated land. Thus, larger farmers registered their group's land in the name of a number of individuals, usually family members. A few ejidos have also organized to export vegetables, but their production accounts for no more than 5 percent of Sinaloa's production.

The production of export vegetables is concentrated among about a dozen of the larger groups. However, the production share of the traditionally larger groups has been eroded in recent years by a few newer groups that have expanded considerably. These relative newcomers, some of whom have produced in Culiacan for over a decade, have apparently invested

heavily in production and marketing innovations that have allowed them to become more competitive. Some of the newcomers also have promoted differentiated products, such as special varieties of vegetables. By contrast, many of the traditional groups have tended to rest on their previous accomplishments and have invested less in yield-boosting or cost-cutting production and marketing techniques. In 1990, the Mexican Government implemented substantial changes in the requirements for tax reporting by companies. Some of the traditionally influential growers who kept relatively lax accounting records have since become aware of their troubled financial positions.

The larger groups of producers tend to be vertically integrated with their own distributorships in Nogales, Arizona. These distributorships may not be wholly owned by the grower in Sinaloa, but a family member of the grower typically retains control of the distributorship so that growers and distributors can act as vertically integrated enterprises. These larger distributors do not handle only their own produce; many contract with smaller growers at the beginning of the season to handle some portion or all of other growers' produce.

Smaller distributors usually contract with growers in Sinaloa to market their produce during the season. In some cases, distributors, large or small, will advance working capital to growers in Mexico for planting, cultivation, and harvesting. Although some smaller distributors prefer to do business with the same growers season after season, some of the contracts between growers and distributors appear to be fairly volatile. Because of the extensive capital and physical inputs distributors provide to growers, they typically charge 8- to 12-percent commission for selling their products.

About 75 distributorships are registered as members of the West Mexico Vegetable Distributors Association (WMVDA). Approximately 113 distributors operated during the 1990/91 season. The nonregistered distributors and brokers operating in Nogales tend to be transient. Although some of the more stable distributorships have changed names or partnerships, the number of distributors remains roughly the same as in the mid-1980's.

In addition to distributors who maintain offices in Nogales, numerous brokers from chain supermarkets spend time there during the winter. These brokers usually scout the quality and supply of produce items in the market and vouch for the quality being shipped to their firms. A few transitory brokers arrive in Nogales, rent a motel room, print business cards, and go into business. These few brokers account for annual variations in the number of distributors.

The concentration of shipments among distributors can be judged by examining the cumulative market shares. The top four distributors account for about 20 percent of total produce shipments, but for individual produce items the concentration is markedly higher: mature green and cherry tomatoes exhibit the highest concentration, with four distributors accounting for 77 percent and 68 percent of shipments.

Production and Trade Associations

Vegetable growers on privately owned land may be affiliated with local, State, and national producers associations. The local growers associations throughout Sinaloa geographically correspond to the major river basins. The most influential of these local associations is the Culiacan River Association (AARC) with headquarters in Culiacan. These associations generally provide their members, who are not limited to vegetable growers, with marketing services and, in some cases, sell inputs such as fertilizer.

The 10 local growers associations of Sinaloa are organized under the umbrella of the Confederation of Agricultural Associations of Sinaloa (CAADES) which was founded in 1932. CAADES supplies its members with statistics regarding all agricultural activities, field crops as well as vegetables. As a representative of Sinaloa's growers, CAADES also presents growers' viewpoints in discussions and negotiations with the State and Federal governments. In addition to its Culiacan headquarters, CAADES maintains an office at the truck compound it operates in Nogales, Sonora, where all export shipments of fruits and vegetables are weighed and some are inspected by the Arizona Federal-State Inspection Service. At the Sonoran compound, CAADES collects a checkoff of $0.02/box which is used to finance the organization.

The National Confederation of Horticultural Producers (CNPH) also has its main headquarters in Culiacan. CNPH collects national statistics on exports of all fruits and vegetables regardless of their State of origin within Mexico. In recent years, CNPH has lost considerable influence as it has been unable to staff its offices and pay for consumer-oriented advertising campaigns in the United States. Although the reasons for CNPH's inability to collect checkoffs are not clear, CNPH has lost its ability to levy mandatory fees on grower members. The Mexican Government used to allow CNPH to collect a per box fee for Certificates of Origin on export produce. This practice was stopped in June 1990 as part of Salinas de Gortari's move toward trade deregulation. New leadership in CNPH hopes to restore some of its previous influence and envisions CNPH playing a more important role as a lobbying organization at the Federal level in Mexico.

Agronomic research on vegetables was formerly carried out at the Agricultural Research Center for the Pacific Northwest (CIAPAN) near Culiacan. The Federal Government of Mexico has significantly reduced funding at CIAPAN to stimulate private research efforts. The best researchers at the station have since been hired by private growers, and the station's budget is quite low. The lack of a concerted joint research effort has contributed to the lack of increase in statewide yields for vegetables in Sinaloa. Some larger growers can afford to maintain their own

research programs and have obtained higher yields. These programs concentrate on applied research, much of it transferring technology developed in the United States to their environment. Very little basic research is conducted in Sinaloa. However, many growers do not have access to the innovations and improved technical methods that a jointly funded or publicly funded research institute could provide.

Vegetable distributors of Mexican produce in Nogales, Arizona, have organized themselves under the auspices of the West Mexico Vegetable Distributors Association (WMVDA). WMVDA acts primarily as a trade association to promote Mexican produce in the United States. Although WMVDA maintains communication with CAADES and other associations in Mexico, no formal or legal connections between WMVDA and associations in Mexico exist.

Export Marketing Channels

Export marketing of Mexican produce to the United States is much the same as that for produce marketed from Florida, after it reaches the distributors' shed in Nogales, Arizona. Produce is harvested in the field and hauled to packing sheds where it is cleaned, sorted, and packed in cartons for shipment. Most produce grown by commercial growers is intended for the export market. Some growers, however, have taken advantage of a growing domestic market in Mexico. An improved distribution system in Mexico has led to greater demands for produce of quality equal to that in the export market. Thus, some shippers choose between the export and domestic markets for some produce packed at the shed. Only low-quality produce was previously shipped to the domestic market, and it was only a small amount of production. The improved domestic marketing system and greater demands for higher quality produce have led export growers to ship up to 30 percent of their production to the domestic market. However, much of this produce is still considered to be of lower quality not suitable for the export market.

After being packed in cartons at the packing shed, export produce is shipped to the border, generally Nogales, Mexico, to enter the United States market. Most produce is shipped to the border by truck, but about 15 percent of the produce is shipped to Nogales, Mexico, by piggyback on rail, offloaded, and brought to the CAADES compound for inspection and clearance by Mexican customs. Produce is also inspected by U.S. Federal-State inspectors at the CAADES compound. Inspection rates vary, depending on the composition of the load. Produce is inspected to ensure that it meets all minimum regulations required in the U.S. market (for example, tomatoes must meet minimum size and quality standards established by Federal Marketing Order number 966). However, Mexican grade and size standards for produce marketed in the U.S. are not always consistent with U.S. established standards.

Mexican trailer trucks then proceed to the U.S. customs compound at the border where customs officials inspect the produce for contraband. Phytosanitary and FDA inspections are also performed at the customs compound. Mexican carriers are then permitted to haul the trailers to distributors in Nogales, Arizona, where the produce is offloaded into storage sheds. These distributors then enter the produce into the U.S. marketing system much like shippers of domestic produce.

Both Mexican and U.S. customs brokers facilitate the movement of produce across the border. About 11 Mexican and 11 U.S. customs brokers operate at the border, but there are no jointly owned U.S.-Mexican brokers. Six new brokerage firms entered the U.S. market during the last decade. Three large customs brokers in Nogales, Arizona, handle the majority of the produce shipped across the border; two of the companies specialize in produce, and a third handles both maquiladora traffic and fresh vegetables. These brokers normally charge $55-$65 per truckload. Because prices across firms are fairly uniform, non-price competition, such as forwarding freight costs with 30- or 60-day credit, is used to attract clients. Customs brokers' are responsible for entering all trade data regarding produce shipments into the Automated Brokerage Input (ABI) software that is compatible with U.S. Customs' computer system. U.S. Customs requires that all brokers pass an initial test to demonstrate error-free use of the ABI software and periodically monitors brokers' entry of data.

Various arrangements between growers or distributors and customs brokers are followed. Some growers and distributors establish long-term relations with a single customs broker, but others change brokers every season. Still others rotate among different brokers on a weekly basis.

Domestic Marketing Channels in Mexico

Shipments from the Culiacan area to the national market are controlled by the Sinaloa Committee for Regulating Vegetables. Each shipment must be accompanied by a manifest (Guia de Transporte) that is checked at one of two check stations, one south of Culiacan on the road to Guadalajara and Mexico City, the other north of Los Mochis. Inspectors at these check stations conduct a random sampling of the produce to verify that the product is packaged correctly and that the produce meets the quality standards set by the Committee. Shippers must pay a fee per box that covers the cost of inspection and personnel at the check stations. The current fee on tomatoes is 20 pesos (U.S.$0.0067) per box. Fees on other produce items vary slightly.

The Sinaloa Committee for Regulating Vegetables meets each week beginning around the first of December to set quality standards for the domestic market. The Committee has representatives of private produc-

ers from each of the agricultural associations in Sinaloa as well as from ejido producers in the area. As recently as 1989, quality standards for the domestic market were not consistent with USDA standards. The Committee has since adopted standards that are equivalent to those used in the export market. As the shipments of produce from the United States have entered the Mexican market, wholesalers and consumers have become more aware of the quality standards to which U.S. producers adhere. To compete with the imported produce, the Committee has adopted USDA standards as the benchmark.

Produce from Sinaloa is marketed in two distinct ways: produce is sold on consignment by a broker in the terminal market, or produce is bought by a representative of a wholesaler in the terminal market who arrives at the grower's field in Sinaloa to inspect the produce. The more common way to sell produce is to the wholesaler's representative. By selling directly to a representative, the grower does not have to arrange transportation or insurance for shipments. The Committee provides growers with price information gathered from various domestic wholesalers so that a grower can verify whether the price being offered by a representative is relatively high or low. Prices in the Mexican market are generally determined by production conditions in other Mexican States. After damaging rains in 1990, the wholesale price in Mexico City was so attractive that some Sinaloa growers diverted part of their export production to the Mexico City market.

Effects of Macroeconomic Policies

The climate for investment in Mexico has improved considerably since the mid-1980's. The structural adjustment policies implemented by the de la Madrid administration (1982-88) have been complemented by an array of macroeconomic policies initiated by the Salinas de Gortari administration. Privatization of such key industries as banking, airlines, and telecommunications has reduced public debt, will likely provide more efficient services, and attract domestic and foreign investment. Stable exchange rates, substantially lowered inflation rates, and a dynamic stock market all provide potential investors with confidence. The North American Free Trade Agreement may enhance these fundamental changes in macroeconomic policy that are allowing Mexico to emerge as an important producer and consumer of goods in the world market.

Policies Affecting Input Prices

A number of specific macroeconomic policies affect the input prices which producers in Sinaloa face. Since the mid-1980's, the Mexican Government has permitted competition with the former Government-owned monopoly producer of fertilizers, Fertimex. Fertilizer prices have thus begun to rise to world price levels. Federal subsidies on electricity for pumping ground water have also been removed. However, the effects of removing these subsidies are minimal in Sinaloa where nearly all water used is surface water from irrigation canals.

Privatization of the banking industry in Mexico may significantly change the cost and availability of capital for agriculture. More efficient lending procedures for investments in agriculture will likely result. But, many growers still do not know precisely what effects privatization will have. Because vegetable production entails substantial production risk, some producers expect that privatization may not increase the supply of capital for their operations. As the banking industry is just beginning to convert to private owners, we cannot gauge the effects on interest rates, transactions costs, and availability of loans for vegetable production.

In an apparent effort to reduce government regulation, the Secretary of Agriculture and Hydraulic Resources (SARH) has allowed a commission of growers to manage a few of the irrigation canals in the Culiacan area. The commission will set water rates and determine allocations of water along the canals. Whether this change in managing irrigation water will result in cheaper water for growers is not clear. Those growers who demand more water and are willing to pay for it will presumably be allocated more water.

Fundamental changes in the operation of the land market will likely accompany the reforms of ejidos. All land transactions between ejidatarios and private owners were illegal before the reforms approved in February 1992, but ejidatarios now have the option to rent, lease, or even sell their lands. In the longer run, these reforms of ejido tenure regimes may decrease land prices as the supply of irrigated land suitable for vegetable production shifts out. In the short run, these reforms should facilitate production agreements and contracts between ejidatarios and private growers. Most producers work in groups as a means of obtaining sufficient land for production. With the new reforms, ejidatarios and private owners can easily agree to work together during the season.

Land reforms in Mexico now permit foreign corporations to own land subject to legal restrictions on the maximum size of holdings. Whether foreign companies will choose to purchase land instead of renting and leasing is not yet clear. Many U.S. producer-shippers do not own the land used in production, preferring instead to lease or contract with growers. The Mexican Government, however, hopes to provide incentives to foreign companies by at least giving them the option to own land.

Efforts to encourage foreign investment in agriculture and agribusiness through joint ventures have also been promoted at the Federal level in Mexico. Various schemes for fostering corporate investment, particularly in agribusiness activities, have been launched. These activities have led to increased foreign investments in shipping operations in Sinaloa.

Joint-venture capital available for the domestic market may complement capital that is already available in Sinaloa primarily for export production and marketing. Although the Sinaloa industry is predominately export oriented, shipments of tomatoes, cucumbers, and bell peppers to Mexico's urban markets have grown to unprecedented levels in recent years. Domestic shipments will likely continue to grow as population and disposable income increase; Sinaloa producers may also diversify their domestic shipments with other vegetables. Although the domestic market has traditionally been a residual market, the domestic market will likely grow more quickly than the export market, making production and marketing arrangements with supermarket chains in Mexico increasingly important for some growers.

Mexico's controlled rate of slippage (devaluation) for the exchange rate coupled with lower rates of inflation have introduced stability in exchange rates since 1989. However, the rate of slippage in exchange rates has been outpaced by the inflation rate, resulting in gradual overvaluation of the Mexican peso. An overvalued exchange rate has two different effects on export producers: growers can buy more pesos with U.S. dollars earned, but costs of inputs purchased abroad are higher in peso terms.

Inflation in Mexico dropped to an annual rate of 14 percent in 1991, the lowest since 1976 (annual inflation rates were 172.6 percent in 1987 and 27.6 percent in 1990). A production cost ratio is used to measure changes in cost competitive positions of Florida and Mexico resulting from peso devaluation and inflation. If we use the exchange rate and prices paid in Mexico and the United States for resources used in production, the ratio measures changes in relative costs of production in Florida and Mexico for products sold in the United States. A cost ratio of less than 1.0 indicates that the cost competitive position has shifted to Mexico relative to the base year of comparison. An increase in the cost ratio indicates a shift in cost competitive position favoring the United States.

The rapid peso devaluation from 1984 to 1987 resulted in Mexico gaining an advantage in its cost ratio (table 31). The rapid inflation that followed from 1987 to 1990 eroded that advantage to where the cost ratio approaches that of the early 1980's. Rapid devaluation of the peso gives Mexican producers temporary advantages in production costs that normally erode as inflation increases.

Labor is one of the major production inputs for produce. Labor has long been thought of as a resource advantage for Mexico because of its abundant availability and its low cost relative to the United States. Table 32 shows the daily wages and average earnings of farm workers in Florida and Sinaloa. Using field labor wages from Mexico and deflating those wages by the exchange rate shows that Mexican farm workers are earning wages as low as those earned as early as 1974/75. While wages have fluctuated, and risen as high as $6.59 per day in U.S. currency in 1980/81,

Table 31--Mexican and U.S. wholesale prices and producer prices and cost ratios for producing vegetables for U.S. markets

Year	Mexican Wholesale Price Index	U.S. Producer Price Index	Exchange rate	Mexico/Florida cost ratio[1]
	1985 = 100		*Pesos/dollar*	
1965	1.7	31.3	12.5	1.911
1970	1.9	35.8	12.5	1.867
1975	3.2	56.7	12.5	1.965
1980	9.5	87.1	23.6	2.032
1981	11.8	94.9	36.7	1.490
1982	18.4	96.9	88.6	.942
1983	38.2	98.1	140.4	1.220
1984	65.1	100.5	203.8	1.398
1985	100.0	100.0	439.7	1.000
1986	188.4	97.1	1,058.7	.806
1987	443.9	99.7	2,169.1	.905
1988	922.5	103.7	2,335.6	1.075
1989	1,070.8	108.8	2,704.9	1.600
1990	1,320.8	112.7	2,970.9	1.735

[1][(MWPI)/(ER/ERBY)]/USPPI, where MWPI is the Mexican Wholesale Price Index, ER is the exchange rate, ERBY is the exchange rate in the base year, and USPPI is the U.S. Producer Price Index.

Source: International Monetary Fund, World Bank, 1990.

Table 32–Wages for farm workers, Mexico and Florida

Season/vegetable	Mexico			Florida	
	Minimum daily wage		Index	Average earnings	Index
	Pesos/day[1]	*Dollars/day*[2]	*1965/66=100*	*Dollars/day*[3]	*1965/66=100*
1965/66	18.17	1.45	100	7.63	100
1966/67	19.50	1.56	108	8.61	113
1967/68	21.17	1.69	117	9.72	128
1968/69	22.50	1.80	124	10.62	139
1969/70	24.86	1.99	137	10.73	141
1970/71	26.75	2.14	148	11.09	145
1971/72	29.06	2.32	160	11.67	153
1972/73	30.90	2.47	170	13.31	174
1973/74	38.70	3.10	214	14.95	196
1974/75	49.09	3.93	271	16.78	220
1975/76	55.60	4.45	307	17.70	232
1976/77	79.91	3.66	252	19.53	256
1977/78	88.31	3.88	268	20.67	271
1978/79	103.44	4.54	313	D.N.C.	D.N.C.
1979/80	124.33	5.45	376	24.03	315
1980/81	154.44	6.59	454	D.N.C.	D.N.C.
1981/82	200.84	5.47	377	27.36	359
1982/83	365.00	4.12	284	D.N.C.	D.N.C.
1983/84	550.00	3.92	270	31.47	412
1984/85	860.00	4.22	291	D.N.C.	D.N.C.
1985/86	1,180.67	2.69	186	30.59	401
1986/87	2,403.33	2.27	157	D.N.C.	D.N.C.
1987/88	5,471.67	2.53	174	30.14	395
1988/89	7,781.67	3.33	230	Disc.	Disc.
1989/90	8,913.33	3.30	228	Disc.	Disc.
1990/91	11,573.33	3.90	269	Disc.	Disc.

D.N.C. = Data not collected.
Disc. = Series was discontinued after 1987/88.
[1] For 1965/66 to 1984/85, minimum daily wages were taken from Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez (1986), p. 51. For 1985/86 to 1990/91, minimum daily wages come from Field Labor Rates quoted by Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues, and Ahumada Astorga, 1990.
[2] Minimum daily wages in Mexico were converted from pesos to dollars by dividing the pay as quoted in pesos by the average monthly exchange rate for the winter produce season, November through June.
[3] Source: U.S. Department of Agriculture, *Agricultural Statistics*, various issues.

Mexican workers earned an average of only $3.90 per day in the 1990/91 season.

Comparing the earnings of Mexican workers with earnings of Florida farm workers indicates that Mexican farm workers earned less than 10 percent of what Florida farm workers earned in 1987/88, the last year comparable data were collected in Florida. However, while labor wage rates may have decreased in Mexico relative to Florida, most Mexican growers contend that labor productivity has declined significantly in recent years. Many growers have adopted production practices that require less labor because of the problems of maintaining and managing a productive work force. For example, many growers have switched from producing staked vine-ripe tomatoes to ground mature green tomatoes, at least partly because of the problems they have had managing labor.

Trends in Production

The winter fresh vegetable industry in Mexico has experienced a growing number of changes through the last decade. The following sections discuss changes in production practices and the trends in production in Mexico for the vegetables considered in this study.

Tomatoes

Export production of tomatoes in Sinaloa has steadily declined from a high of 22.0 million cartons in 1985/86 to 14.8 million cartons in 1990/91 (table 33). Total export yields (computed from table 33 by dividing the total export production of 25-pound carton equivalents by total area planted) have also declined from a high of 661 cartons per acre in the 1985/86 season to 444 cartons per acre in 1990/91. Prices have varied considerably, from a low of $4.35 per 25-pound carton equivalent in 1986/87 to more than $20 per 25-pound carton equivalent in 1989/90 when Florida experienced the severe freeze in December 1989.

One reason tomato yields in Mexico have declined is because a large number of growers have switched to growing mature green tomatoes in recent years. Mature green tomatoes are usually harvested only a few times, whereas vine-ripened tomatoes may be harvested repeatedly throughout the season, resulting in higher yields. Problems in managing labor and hopes of increasing quality have caused some of the larger growers to begin growing mature green tomatoes. Mature green tomatoes historically accounted for only a small part of the production in Mexico, but today mature green production represents as much as 30 percent of total production.

Another reason for no appreciable growth in tomato yields is the lack of a coordinated research program that would allow Sinaloa growers to solve new production problems presented by new or intensified pests and viruses. Some individual growers carry out research trials, but no public or jointly sponsored research station generates yield-increasing applied research. Most of the growers with active research programs have some access to U.S.-based technology through joint ventures. The agricultural research station that formerly carried out applied research on vegetable crops no longer functions in an effective manner.

Bell Peppers

Bell pepper production significantly increased from a low of 2.8 million cartons in 1980/81 to a high of 6.5 million cartons in 1988/89 (table 34). Production increased from both increased acres planted and yields. Acres planted increased from 6,798 acres in 1980/81 to 16,328 acres in 1986/87, ending at 12,619 acres in 1990/91. Yields increased from 410 cartons per acre in 1980/81 to 483 cartons per acre in 1990/91. Part of the increase in acreage is due to increased plantings of colored bell peppers, notably yellow, red, and orange. Recently introduced hybrids are contributing to increased yields and quality.

Cucumbers

Export production of cucumbers increased from 4.1 million cartons in 1981/82 to about 6 million cartons in 1990/91 (table 35). The area planted in cucumbers

Table 33--Sinaloa fresh tomatoes: Area planted, yield, production, and value[1]

Season	Area planted			Export yield per acre			Export production		Export value per carton		Total export value
	Total	Stake	Ground	Total	Stake	Ground	Stake	Ground	Stake	Ground	
	---------Acres---------			*26.2-lb cartons --(equivalents)--*		*30-lb cartons*	*1,000 cartons*		*--Dollars/carton--*		*1,000 dollars*
1980/81	33,299	22,531	10,769	486	649	126	14,626	1,356	12.25	13.69	197,727
1981/82	31,498	21,500	9,998	509	700	85	15,060	850	7.29	7.29	115,985
1982/83	36,447	26,032	10,415	520	659	131	17,160	1,362	8.66	10.60	163,045
1983/84	37,856	29,247	8,609	551	617	287	18,040	2,470	7.28	7.11	148,891
1984/85	37,011	31,112	5,898	600	591	564	18,387	3,326	n.a.	n.a.	n.a.
1985/86	35,642	31,594	4,047	631	582	885	18,378	3,582	n.a.	n.a.	n.a.
1986/87	37,955	36,237	1,717	588	448	n.a.	16,248	5,308	4.80	4.93	104,180
1987/88	33,462	32,664	798	480	334	n.a.	10,908	4,509	5.51	4.36	79,667
1988/89	32,914	28,683	4,230	459	368	937	10,569	3,964	6.75	7.31	100,293
1989/90	36,403	29,991	6,412	398	327	634	9,820	4,064	18.50	25.95	287,174
1990/91	36,714	29,286	7,428	423	340	655	9,964	4,868	5.90	9.03	102,750

n.a. = Not available.

[1] Beginning in 1986/87, Stake and Ground categories are replaced by Vine Ripe and Mature Green, respectively. Carton sizes were kept the same at 26.2 and 30 pounds, respectively.

Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues.

Table 34--Sinaloa bell peppers: Area planted, yield, production, and value

Season	Area planted	Export yield per acre	Export production	Export value per carton	Total export value
	Acres	*25-lb cartons*	*1,000 cartons*	*Dollars/carton*	*1,000 dollars*
1980/81	6,798	410	2,786	20.19	56,240
1981/82	6,605	636	4,199	11.98	50,310
1982/83	9,019	326	2,944	17.28	50,871
1983/84	13,526	335	4,527	10.98	49,708
1984/85	14,386	373	5,363	n.a.	n.a.
1985/86	12,926	383	4,947	n.a.	n.a.
1986/87	16,328	364	5,942	8.03	47,711
1987/88	15,266	407	6,208	7.09	44,002
1988/89	13,541	477	6,461	7.88	50,901
1989/90	11,322	533	6,030	15.57	93,907
1990/91	12,619	427	5,386	9.28	50,008

n.a. = Not available.
Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues.

Table 35--Sinaloa cucumbers: Area planted, yield, production, and value

Season	Area planted	Export yield per acre	Export production	Export value per carton	Total export value
	Acres	*25-lb cartons*	*1,000 cartons*	*Dollars/carton*	*1,000 dollars*
1980/81	12,390	395	4,899	12.30	60,260
1981/82	10,074	406	4,086	13.74	56,147
1982/83	17,129	258	4,425	16.31	72,144
1983/84	18,120	231	4,187	13.12	34,933
1984/85	20,539	220	4,522	n.a.	n.a.
1985/86	15,814	332	5,250	n.a.	n.a.
1986/87	18,738	296	5,539	9.10	50,420
1987/88	19,709	320	6,303	6.73	42,414
1988/89	19,276	334	6,444	11.23	72,356
1989/90	17,559	371	6,510	9.02	58,738
1990/91	15,651	378	5,916	12.33	72,840

n.a. = Not available.
Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues.

varied around 18,000 acres during most of our study years. Increased cucumber yields are due primarily to the adoption of improved varieties and cultivars.

Eggplant

Planting and export production of eggplant has been characterized by sizable swings due to adverse weather and growers' price expectations. Yields fell steadily from around 900 cartons in 1981/82 to fewer than 600 cartons by 1988/89 (table 36). With the adoption of new hybrids replacing the Beauty types, yields rebounded in 1989/90-1990/91. Export production averaged about 1.4 million cartons throughout our study years.

Squash

Export production of squash increased from 1.3 million cartons in 1980/81 to 2.6 million in 1989/90-1990/91 (table 37). Both area planted and yields also tended to increase. Improved cultivars are responsible for the boost in yields.

Competitive Advantage Analysis

Competitive advantage between two areas in the production and marketing of a commodity depends on

Table 36--Sinaloa eggplant: Area planted, yield, production, and value

Season	Area planted	Export yield per acre	Export production	Export value per carton	Total export value
	Acres	*25-lb cartons*	*1,000 cartons*	*Dollars/carton*	*1,000 dollars*
1980/81	1,401	889	1,246	6.69	8,337
1981/82	1,344	907	1,220	4.93	6,014
1982/83	1,784	808	1,442	7.49	10,803
1983/84	2,231	695	1,551	5.05	7,835
1984/85	1,670	805	1,334	n.a.	n.a.
1985/86	2,076	689	1,430	n.a.	n.a.
1986/87	1,824	715	1,304	5.52	7,201
1987/88	2,424	690	1,674	6.58	11,006
1988/89	2,661	558	1,485	4.76	7,078
1989/90	1,201	1,017	1,221	12.49	15,247
1990/91	2,157	802	1,729	6.48	11,211

n.a. = Not available.
Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues.

Table 37--Sinaloa squash: Area planted, yield, production, and value

Season	Area planted	Export yield per acre	Export production	Export value per carton	Total export value
	Acres	*25-lb cartons*	*1,000 cartons*	*Dollars/carton*	*1,000 dollars*
1980/81	6,212	217	1,349	12.14	16,378
1981/82	7,260	256	1,860	9.03	16,792
1982/83	8,609	217	1,865	7.81	14,568
1983/84	9,805	157	1,539	7.27	11,191
1984/85	9,041	229	2,074	n.a.	n.a.
1985/86	7,104	327	2,326	n.a.	n.a.
1986/87	9,145	345	3,152	10.36	32,662
1987/88	12,004	212	2,546	11.40	29,019
1988/89	11,186	316	3,536	10.38	36,692
1989/90	9,177	289	2,569	8.40	21,575
1990/91	8,920	296	2,641	9.80	25,876

n.a. = Not available.
Source: Confederacion de Asociaciones Agricolas del Estado de Sinaloa, various issues.

the net returns growers in each area receive from producing and marketing that commodity. As such, net competitive advantage depends on the costs of producing and marketing the commodity and the revenues received.

Net competitive analysis is determined by estimating the cost of production and marketing for competing areas, including all costs for bringing the product into the destination market. In this manner, the analysis involves including the cost of transporting the product to the country of import and any costs associated with getting the product into the country, such as tariffs and other fees associated with getting the product across the border.

Production costs are only half of the analysis required for determining competitive position using these procedures. Revenues must also be analyzed, especially when the products involved are perishable and the production period cannot be altered because of climatic or other conditions. Production costs are the major concern if a commodity is storable. However, the fresh vegetables of concern in the winter market are not storable and, in fact, must reach the consumer as soon as possible for most crops or they will decay. Another

factor making revenues important to the analysis is that growers will produce over an extended period to effectively use such inputs as labor. Because of these and other factors, there is considerable overlap in production between areas. Therefore, revenues received are as important as costs in determining competitive position of different suppliers. High-cost suppliers may be better able to compete in the market if the timing of their production yields higher revenues, offsetting their disadvantage in production costs.

Net competitive advantage in the U.S. winter fresh vegetable market was previously estimated for the 1984/85 production season (Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez, 1986). Commodities included in the analysis were green beans, cucumbers, eggplant, squash, bell peppers, and tomatoes. The results of that analysis found Florida to hold the competitive advantage for eggplant and Mexico to hold the competitive advantage in all other crops. Mexican growers produce all of the identified crops more cheaply, but the costs of delivering the products to the border and getting the products into U.S. markets offset their cost of production advantage for all crops but eggplant.

Methodology

The competitive advantage analysis used budgets developed from Smith and Taylor (1991) and production budgets maintained by the Mexican grower organization CAADES. Although CAADES budgets provide an overview of competitive advantage, we decided that CAADES budgets were not accurate in the technology used for producing these crops. CAADES budgets are for "average" producers for each of the crops in Mexico, whereas ability to compete is established by larger export producers. Observation of the crops demonstrated differences that existed in production practices between large export growers and the "average" producers. These differences were not reflected in the CAADES budgets. In a recent study of 1990/91 production cost advantages for these crops (Cook, Benito, Matson, Runsten, Swedel, and Taylor, 1991), the Mexican budgets were not adjusted which provided for some differences in this analysis.

In general, production costs for Mexico were estimated from onsite visits with producers and shippers and from examination of the general ledgers used to keep track of expenses and revenues. The budgets were developed from those involved in growing the crops and from actual expenses incurred. Production costs for Florida were used as collected from annual production budget surveys conducted by the University of Florida (Smith and Taylor, 1991). Methods used to collect data and develop the Florida budgets are similar to those used in Mexico (for a discussion of that methodology, see Smith and Taylor, 1991).

This study found the major difference between Florida and Mexico in the development of the budgets lies in the machinery component. Mexico only recently implemented laws for the collection of income tax on business profits. As part of this, the handling of expenses for machinery and equipment is different than in the United States. Fixed machinery and equipment expenses for Florida growers include interest expense, taxes, insurance, and depreciation. A variable expense is also calculated that includes fuel, oil, repair, and maintenance. Fixed machinery expenses generally total 30 to 50 percent of the total machinery cost for producing the crops of interest in Florida.

Machinery expenses in the Mexican budgets were determined from custom rates being charged by Mexican growers. Mexico has minimum custom rates for various production and marketing operations. These custom rates were compared with actual expenses incurred by Mexican growers as identified in their general ledger and adjusted accordingly. Machinery expenses identified in the general ledgers were typically higher than the quoted custom rates.

Production costs were estimated for cucumbers grown in Sinaloa, Mexico, and southwest Florida, squash grown in Sinaloa and Dade County, eggplant grown in Sinaloa and Palm Beach County, bell peppers grown in Sinaloa, Palm Beach County, and southwest Florida, tomatoes grown in Sinaloa, Dade County, and southwest Florida, and spring tomatoes grown in west central Florida. These budgets allow comparisons of cost of production and marketing to determine cost competitive advantage for each of the identified crops.

The following presents a comparison of production practices and costs of production in Florida and Mexico for each of the identified crops. Costs include all expenses associated with producing, harvesting, packing, and marketing the product in U.S. markets. In Mexico, tomatoes, bell peppers, and squash are also sold in the domestic market. Export yields for these commodities are higher and, thus, adjustments have been made appropriately to preharvest costs. For these commodities, both the preharvest costs and yields are adjusted to reflect the export only share. Squash and eggplant were the only two crops where all of the production is sold for the export market, thus no adjustment is made to either the preharvest cost or yield.

Mexican budgets include transportation costs to the U.S. border and all fees for crossing the border. Cost

figures for Mexico were quoted in pesos and converted to dollars using an exchange rate of 2,950 Mexican pesos to 1 U.S. dollar.

Tomatoes

Competition in tomatoes has generally led the debate in the produce industry. The following sections discuss the production practices in Florida and Mexico and then compare the cost of production for the two areas.

Production Practices in Florida

Production practices for tomatoes grown in Florida vary considerably among the major production areas. More uniformity in production practices has evolved over the past 3 years in that all areas use plastic mulch, stakes, irrigation, and transplants. Now tomatoes are grown on a year-round basis in one area or another. Recommended cultivars include Duke, Flora-Dade, Freedom, FTE 12, Hayslip, Pacific, Sunny, and Solar Set. Although windbreaks are recommended, most growers do not use them.

The crop is established using transplants. Rows of tomatoes are spaced 5-6 feet apart. Plants within rows are spaced 18-24 inches apart. Fertilization practices are normally based on soil tests. The optimum pH for tomato production is between 6.0 and 6.5. Calcium and magnesium levels are corrected according to soil tests. The fertility requirement for mulched irrigated tomatoes grown on mineral soil is 160-160-160 (nitrogen (N) - phosphate (P_2O_5)-potash (K_2O)) with none to two supplemental applications of 30-0-20. On the rockdale soils of the Homestead area, 130-220-260 with supplemental applications of 30-0-20, none to two times, is normally used. Depending on location, irrigation may be by seep or overhead irrigation; otherwise, drip irrigation can be used anywhere. If available, frost protection is by overhead irrigation.

Pest problems for tomatoes include nematodes, bacterial soft rot, bacterial speck, bacterial spot, bacterial wilt, black shoulder, blossom-end rot, brown root rot, Phytophthora, damping-off, early blight, fusarium wilt, fusarium root rot, gray leaf spot, gray mold, late blight, leaf mold, phomea rot, potato Y virus, pseudo curly top, sclerotinia stem rot, soil rot, southern blight, target spot, tobacco etch virus, tobacco mosaic virus, tomato yellows virus, gemini virus, and verticillium wilt. Insects affecting tomatoes in Florida include aphids, whitefly, thrips, armyworms, tomato fruit worm, tomato pinworm, hornworm, looper S, leaf miners, stink bugs, banded cucumber beetle, cutworms, wireworms, and mole crickets. Weeds are controlled by use of plastic mulch and herbicide application.

All tomatoes are harvested by hand. Most tomatoes are harvested at the mature green stage, but vine-ripened fruit production is increasing in Florida. Tomatoes are brought to a packing house, placed in a dump-tank with chlorinated water, then sized and quality graded. Most Florida tomatoes are waxed prior to shipping. Grades include U.S. No. 1, U.S. No. 2, and U.S. No. 3. There is also a provision for an 85-percent U.S. No. 1 grade. Sizes include medium, large, and extra large. The Federal Marketing Order 966 for tomatoes currently restricts the shipment of sizes smaller than medium and the shipment of medium U.S. number 3 tomatoes. Most of the mature green tomato crop is picked two to three times. Ethylene is used to promote ripening. Mature green tomatoes are placed in a container that must hold 25 pounds. Vine-ripe red tomatoes are shipped in 20-pound containers.

Tomato fruits are subject to chilling injury. Optimum conditions for ripening are 68°F and 85-95 percent relative humidity. Tomatoes can be held at temperatures as low as 50°F, but chilling injury occurs below that.

Production Practices in Mexico

Tomatoes grown in Mexico for the U.S. market have traditionally been staked. Recent modifications have reduced the number of stakes used with more string being used to reduce the cost. Staking is advantageous especially in production of vine-ripened fruit.

A recent trend has been toward harvesting more mature green fruit. About 30 percent is handled this way, but the trend is leveling off. Besides not having the expense of staking, this approach reduces labor cost because fields are picked once a week instead of every day, as are vine-ripened tomatoes, and can be carried and packed mechanically instead of by hand. Tomatoes grown on the ground seem to be suited for mature green harvest. The crop grown on the ground for mature green production is harvested three to four times. The mature green fruits, which are gassed later, ship better over longer distances than vine-ripened fruits. About 30 percent of the Sinaloa crop is grown on the ground, although one large grower has 70 percent of his acreage without stakes.

Planting dates, which correspond to harvest seasons, are grouped into three periods: (1) September to October 10, (2) October 10 to November 10, and (3)

after November 10. Most fields are established by transplanting. Seeds are germinated and grown in styrofoam trays in plastic-covered greenhouses for about 4 weeks before being moved to the fields and planted by hand. Starting plants in a greenhouse is a more economical way to use the high-priced seed of hybrids than direct seeding in the field. With transplants, better stands are obtained resulting in more production per acre. Rows of tomatoes are spaced 1.5 to 2 meters apart (5 to 6.5 feet) with plants about 0.25 to 0.35 meter (10 to 14 inches) apart in the row. A desired population per hectare is around 15,000-16,500 plants.

Big changes have been made in varieties used. Hybrids developed by U.S. public and private breeders have given Mexican growers a good product for both the export and national markets. Some commonly used cultivators are Carmen, Solarset, Tres Rios, Contessa, Hurmayo, Sunny, Empire, Pacific, Olympic, Sonar, Tango, Merced, AC 5001, Amigo, Saladette, Bingo, Condor, and Sweepstakes. Some interest has been shown in long-shelf-life types.

Some growers are experimenting with mulching tomato rows with polyethylene film, but unlike Florida this practice is not accepted as the standard. Chemicals, similar to those used and approved in the United States, are essential in fertilizing the crop and in controlling weeds, insects, and diseases. Progressive growers use tissue analysis and experience to determine fertilizer needs of the plants. Integrated pest management methods and biological controls are being integrated into the management system. At least one grower is producing organically grown vegetables for the U.S. market. Some of the important problems are whitefly, aphid, leafminer, pinworm, and virus.

With water plentiful, furrow irrigation is most commonly used. Applications are made every 7 to 10 days, depending on weather and stage of crop. Drip irrigation is being used on a trial basis. Growers are looking at drip as an efficient management tool for applying fertilizers and pesticides as well as water.

Tomatoes are picked by hand in buckets and dumped into fiberglass trailers (gondolas). At the packinghouse, fruits are dumped from trailers into chlorinated water, which washes and carries tomatoes to sorting and packing belts and tables. Vine-ripened fruit are hand packed into two- and three-layer lugs (cartons), while mature green fruits are placed mechanically in cartons.

Production Costs in Florida and Mexico

Mexico has been increasing exports of mature green tomatoes, although vine-ripened tomatoes continue to dominate. Table 38 compares production costs for mature green tomatoes grown in Dade County, southwest Florida, and west central Florida, and vine-ripened tomatoes grown by predominantly large growers in the Culiacan area of Sinaloa. About 20 percent of the Mexican tomatoes grown for the export market are actually sold in Mexico. Total preharvest costs for Mexican tomatoes were adjusted to reflect this by allocating only 80 percent of preharvest costs for export tomatoes.

Preharvest costs for tomatoes were significantly lower in Mexico than in Florida. Total preharvest costs for Mexico were $3,140 per acre compared with $3,903 in Dade County, $4,348 in west central Florida, and $5,115 in southwest Florida. The adjusted preharvest cost for Mexico was $2,512. Miscellaneous and overhead, labor, pesticides, and machinery were the largest cost categories in the four areas, amounting to 74-78 percent of the total preharvest cost in all four production areas. Dade County's preharvest cost per box of $3.00 is the lowest of all three Florida production areas. Mexico's adjusted preharvest cost per carton was the lowest of all areas at $2.86.

Yields per acre for the three production areas in Florida were about the same, from 1,300 25-lb cartons in Dade County to 1,400 in the southwest and in west central's spring crop. The Mexican export tomato yield of 880 cartons per acre was significantly lower than all Florida areas.

Per carton harvest and haul costs are surprisingly similar in Florida and Mexico. This apparent inconsistency in lower per unit labor costs in Mexico and similar harvesting costs may be due to the low productivity of labor in Mexico, as argued by Mexican growers, which offsets their low labor wage rates. Packing costs were up to $1.00 higher in Florida than in Mexico because of lower wage rates in Mexico. Better supervision and more productive workers than in the fields allow Mexican packinghouses to realize lower costs relative to Mexican field labor and relative to Florida packing costs.

Marketing costs for Mexico are significantly higher than in Florida. Florida growers pay a flat fee for selling, while Mexican growers must pay for transportation to

Table 38--Mature green tomatoes in Florida and vine-ripened tomatoes in Sinaloa, Mexico, production and marketing costs, 1990/91

Item	Dade County, Florida	Southwest Florida	West central Florida	Sinaloa, Mexico
			Dollars/acre	
Preharvest expenses:				
Land rent	325.00	333.00	205.00	156.23
Transplants	201.70	330.00	270.00	141.99
Fertilizer	339.50	290.50	334.08	241.99
Pesticides	756.88	705.03	982.13	530.55
Labor	710.19	1,140.61	793.94	787.30
Machinery	438.75	721.35	675.64	307.06
Miscellaneous and overhead	975.28	1,426.45	919.82	835.93
Interest	155.63	168.01	167.41	126.56
Total	3,902.93	5,114.95	4,348.02	3,139.91
Total for 80 percent for export	N.A.	N.A.	N.A.	2,511.93
			25-lb cartons/acre	
Yield	1,300	1,400	1,400	880
			Dollars/carton	
Preharvest unit cost	3.00	3.65	3.11	2.86
Harvest and postharvest expenses:				
Harvest and haul	.83	.93	.65	.86
Packing	2.42	2.52	2.27	1.51
Marketing--				
Transport to U.S. border	N.A.	N.A.	N.A.	.73
Tariff[1]	N.A.	N.A.	N.A.	.46
Other crossing fees	N.A.	N.A.	N.A.	.11
Selling cost	.15	.15	.15	.64
Total	6.40	7.25	6.18	7.16

N.A. = Not applicable.
[1] U.S. tariff rate equals the weighted average rate for the 1990/91 season. See table 54.

the border, border crossing fees, U.S. duties, and a sales commission. Mexico's total marketing cost for tomatoes was $1.94 per carton compared with only $0.15 in all Florida areas.

Bell Peppers

Competition for market share in bell peppers has been the closest of any of the study vegetables. The following sections discuss the production practices in Florida and Mexico and then compare the cost of production for the two areas.

Production Practices in Florida

In Florida, bell pepper cultivars include Early Calwonder, Gator Bell, Jupiter, Shamrock, Skipper, and Yolo Wonder L. Soil testing is recommended, and pH should be adjusted to 6.0-6.5. Crop nutrition requirements are also normally based on soil tests. Nitrogen is normally applied at 160 to 240 pounds per acre, depending on soil type and irrigation method. Adequate calcium is important for reducing blossom-end rot. Windbreaks using sugar cane, rye, or oats are essential for crop protection. Plastic mulch, black dur-

ing the cool season and white during the warm season, are used with methyl-bromide as a fumigant. The crop can be established using either direct seeding (plug mix planting) or through transplants (containerized). Seeding starts in July with first harvests in mid- to late October. Harvesting continues, as plantings are made through the season, until July. Row distances, number, and within-row spacings vary according to grower needs. Single or double rows are commonly used with row spacings as close as 18 inches within rows and 48 inches between rows, with up to 15,000 plants per acre.

Peppers must have irrigation in Florida. On sandy soils, peppers require 1/2 to 1 inch of water per week during early growth and 1 to 1-1/2 inches during fruiting. Seep irrigation maintains constant levels of moisture but has low water-use efficiency and cannot be used in all pepper-producing areas. Overhead irrigation is used by some growers, but this method increases the potential for spreading foliar disease organisms. Drip irrigation is now being tested and used on some of the acreage. Drip irrigation is the most efficient method to meter water and nutrients to the plants without wetting the foliage. This method also reduces salt injury to the plants.

The most effective method used for frost protection is overhead irrigation during the freeze period. Other methods include row covers such as hoop-supported polyethylene or unsupported nonwoven materials. Pest problems include nematodes, damping-off, bacterial spot, frog-eye spot, Southern blights, phytophthora, erwinia soft rot, gray leafspot, sclerotinia, stem rot, wet rot, viruses (pepper mottle, potato Y, tobacco etch, and tobacco mosaic), aphids, armyworms, corn earworms, cutworms, leafminers, lesser cornstalk borers, flea beetles, mole crickets, whiteflies, pepper weevils, and wireworms. Weed control is less of a problem when plastic mulch is used, and fields are normally managed to reduce weed populations in the off season.

Readiness of peppers for harvest is judged by fruit size, color, and firmness. Peppers in Palm Beach County are generally field packed, but peppers in southwest Florida are generally shed packed. There are three grades for peppers: U.S. Fancy, U.S. No. 1, and U.S. No. 2. The first two grades are based on size, but U.S. No. 2 is based on appearance. If at least 90 percent of the pepper shows any amount of a shade of red, it may be designated as red. Prompt thorough cooling to 50°F maintains fruit quality the longest. Forced-air cooling and vacuum cooling are the most effective cooling methods. The maximum shelf-life for peppers stored at 50°F and 95-percent relative humidity is estimated to be 3 weeks.

Production Practices in Mexico

Bell peppers in Mexico are grown primarily from transplants, which are produced in styrofoam trays (150 type Speedling trays). No machinery is used for seeding in the trays, and thus, coated seeds are not used. Cultivars used are similar to those in Florida and rely heavily on new hybrids, including Bell Captain, Galaxy, open-pollinated types like Jupiter, and various new colored (other than green) types. Some jalapeno peppers are grown for the domestic market. Plant spacing is mostly 1.25 meters (about 4 feet) between rows to allow passage for mules but is changing to 1.5- to 2-meter (5 to 6.5 feet) spacing to allow passage for small Kubota or John Deere tractors. Single rows are commonly used for green-fruited types, but double rows are used for colored types. Plants are set in the field by hand and staked using string. The crop is cultivated and irrigated every two weeks. The use of stakes is expensive both for the materials (stakes and string) and labor. Pests are a problem, especially all viruses affecting peppers. Spraying is commonly done by hand with backpack sprayers. No protection of workers for chemical poisoning is practiced. Pesticides are commonly mixed directly in the field. Harvesting is done by hand, usually twice a week.

Peppers are generally grown with furrow irrigation without plastic. Several producers are experimenting with plastic mulch and drip irrigation on up to several hundred acres. During the warmer months, white or black plastic mulch is used for double-row peppers grown on a bed. These systems are identical to those being used in Florida.

Production Costs in Florida and Mexico

About 15 percent of the Mexican bell peppers harvested for export are sold in Mexico. Preharvest costs were adjusted to reflect this by allocating only 85 percent of preharvest costs for export bell peppers.

Preharvest costs for Mexican bell peppers were $3,365 per acre during the 1990/91 season (table 39). The principal cost categories were miscellaneous and overhead, labor, pesticides, and machinery, which represented 75 percent of all preharvest costs. Preharvest costs for bell peppers in Florida were $5,147 in Palm Beach County and $4,676 in southwest Florida. The largest cost categories were miscellaneous and overhead, machinery, pesticides, and transplants, amounting to 66-68 percent of all preharvest costs. Land rent was almost twice as much in Palm Beach County compared with southwest Florida. Machinery was $375 higher in southwest Florida than in Palm Beach County, Florida, but miscellaneous and

Table 39--Bell peppers in Florida and Mexico, production and marketing costs, 1990/91

Item	Palm Beach County, Florida	Southwest Florida	Sinaloa, Mexico
		Dollars/acre	
Preharvest expenses:			
Land rent	600.00	333.00	155.57
Transplants	700.00	700.00	269.15
Fertilizer	329.00	360.10	291.25
Pesticides	900.10	745.50	547.42
Labor	922.75	746.03	769.88
Machinery	457.12	833.03	318.07
Miscellaneous and overhead	1,095.57	834.03	877.81
Interest	141.99	124.56	135.62
Total	5,146.53	4,676.25	3,364.77
Total for 85 percent for export	N.A.	N.A.	2,860.05
		28-lb cartons/acre	
Yield	1,000	1,000	756
		Dollars/carton	
Preharvest unit cost	5.15	4.68	3.79
Harvest and postharvest expenses:			
Harvest and haul	[1]	[1]	.55
Packing	2.48	3.55	1.38
Marketing--			
Transport to U.S. border	N.A.	N.A.	.85
Tariff[2]	N.A.	N.A.	.70
Other crossing fees	N.A.	N.A.	.16
Selling cost	.50	.43	.71
Total	8.13	8.66	8.15

N.A.=Not applicable.
[1] Included in packing.
[2] U.S. tariff rate equals the weighted average rate for the 1990/91 season. See table 54.

overhead costs were over $260 higher in Palm Beach County than in southwest Florida. The adjusted preharvest cost in Mexico (not counting the costs of the 15 percent sold domestically) was only 55 percent of the preharvest cost in Palm Beach County and only 61 percent of preharvest cost in Southwest Florida.

Both production areas in Florida had the same yield of 1,000 bushels per acre, while Mexico's export yield was only 756 bushels per acre. Per unit preharvest costs were $5.15 in Palm Beach County and $4.68 in southwest Florida. With a relatively low preharvest cost in Mexico, the per bushel cost of $3.79 was the lowest of all areas despite the lower yield in Mexico.

Harvesting and packing costs in Mexico during the 1990/91 season were much lower than in the two Florida production areas. Bell peppers in Palm Beach County generally are harvested and packed in the field, which helps explain the higher packing cost than in southwest Florida.

Marketing costs were significantly higher for Mexican bell peppers than for Florida bell peppers. Mexico's cost includes transportation to Nogales, Arizona, crossing fees, U.S. tariff, and sales commission. In contrast, Florida's selling cost was a flat fee of $0.43 per box in southwest Florida and $0.50 per box in Palm Beach County, Florida.

Cucumbers

While previous studies have shown Florida to have a net competitive advantage for cucumbers, Mexico has dominated the U.S. market for cucumbers. The following sections discuss the production practices in Florida and Mexico and then compare the cost of production for the two areas.

Production Practices in Florida

Florida grows both slicing and pickling cucumbers, mostly for the fresh market, regardless of type. Recommended pickling types are Addis, Calypso, and Carolina. Recommended slicing types include Centarrion, Dasher II, Early Triumph, Floracuke, Raider, Sprint 440, and Poinsett 76-S. Cucumbers can be grown on any type of soil, but sandy soils are best. The field should be relatively weed-free because few effective herbicides are registered for use on cucumbers. Herbicide residues, especially triazine, will be readily taken up by cucumbers. In Florida, cucumbers are grown on raised beds, 3 to 8 inches high. Some growers use mulch, generally black plastic, for production. Many times cucumbers are grown on plastic as a second crop to tomatoes, especially in southwest Florida. Cucumbers are grown virtually year-round, but the major harvest seasons are September to June.

Plant spacing varies from 36 to 60 inches between rows and 3 to 12 inches within the row. The newer pickle lines are determinant and are more densely planted. Windbreaks of rye, wheat, or some type of cover crop are very useful to reduce wind-related injury to young crops.

The optimum pH for cucumbers is 6.0 to 6.5. On sandy soils, fertilizer is normally applied according to a soil test to give 90-120-120 of N-P_2O_5-K_2O and up to three additional applications of 30-0-20 are applied depending on rainfall and crop growth patterns. Half of the nitrogen and potassium is usually applied at planting, the rest is banded in split applications until the plants begin to grow as vines.

Cucumbers in Florida must have irrigation, especially during the germination, fruit-set, and fruit growth periods. Pollination with bees, one to two hives per acre, is also necessary for optimum fruit yields and quality. The bees are brought to the fields as the plants begin to flower. The bees must be protected from pesticides.

Pests that affect cucumber production in Florida include nematodes, aphids, armyworms, cucumber beetles, cutworms, flea beetles, leafminers, mites, mole crickets, pickleworm, stink bugs, thrips, wireworms, and whiteflies. The major diseases include angular leaf spot, anthracnose, belly rot, cottony leak, damping-off, downy mildew, fusarium wilt, gummy stem blight, powdery mildew, scab, target spot, and watermelon mosaic virus 1 and 2. The use of herbicides for weed control is limited, and thus, mechanical control and plastic mulching are widely used.

All cucumbers are harvested by hand in Florida, generally requiring 150 laborer-hours per acre for the season. Harvesting is done frequently, in 3- to 4-day intervals, to optimize fruit size. All cucumbers are washed in chlorinated water then graded. Grades for slicers include U.S. Fancy, U.S. Extra No. 1, U.S. No. 1, U.S. No. 1 Small, U.S. No. 1 Large, and U.S. No. 2. Grades for picklers depend on the processors' requirements or sold on the fresh market as U.S. No. 1, U.S. No. 2, and U.S. No. 3. Slicers are usually waxed, but picklers are not. Cucumbers can be held from 10 to 14 days at 50° to 55°F at high relative humidity. At temperatures below 50°F, chilling injury readily occurs.

Production Practices in Mexico

Both pickling and slicing cucumbers are grown in Mexico. There are four to five growers of pickles. The major pickle cultivars include Lista, Eureka, Hybrid P, Lucky Strike, Calypso, Fancipak, Conquest, Carolina, and CR Country. Harvesting takes 20 people per hectare per day. Dasher II is a popular slicing cultivar, and others grown are Supersett, Poinsetta, Early Triumph, Sonata, Medalist, Marathon, and Trail Blazer. During harvest season, the slicer crop may be harvested only twice a week for 2 months. Cucumbers are harvested by hand and hauled in fiberglass trailers to packing sheds where fruits are washed, waxed, graded, and packed according to size in 1-1/9-bushel cartons.

Cucumbers are generally direct-seeded on single rows on beds about 6.5 feet apart and spacing of five plants per 40 inches in the row. They are staked and trellised with string. Serious pests include target spot, pickle worm, and aphids. All other production practices are similar to those used in Florida, including fertility practices, the use of bees, and harvest and handling procedures.

Production Costs in Florida and Mexico

About 15 percent of the Mexican cucumbers harvested for the export market end up being sold domestically. Preharvest costs were adjusted to reflect this by allocating only 85 percent of preharvest costs for export cucumbers.

Florida cucumbers planted for early spring production are grown mostly as a second crop, usually after tomatoes. This practice permits Florida growers to use some of the residual inputs from the tomato crop for cucumbers. As such, preharvest costs are significantly lower for cucumbers than for tomatoes, peppers, and eggplant.

Miscellaneous and overhead, labor, machinery, and pesticides accounted for 77 percent of all preharvest costs for Mexican staked cucumbers (table 40). Preharvest costs in Florida were $425 less than in Mexico. Labor costs for cucumbers in Florida represented a much smaller portion of total preharvest costs

Table 40--Staked cucumbers in Florida and Mexico, production and marketing costs, 1990/91

Item	Southwest Florida	Sinaloa, Mexico
	Dollars/acre	
Preharvest expenses:		
Land rent	333.00	155.57
Transplants	73.00	67.94
Fertilizer	252.00	193.00
Pesticides	211.31	224.60
Labor	482.58	582.50
Machinery	215.48	236.78
Miscellaneous and overhead	197.87	698.45
Interest	59.97	90.67
Total	1,825.21	2,249.52
	55-lb bushels/acre	
Yield	600	553
	Dollars/bushel	
Preharvest unit cost	3.04	3.46
Harvest and postharvest expenses:		
Harvest and haul	1.80	.78
Packing	2.61	1.64
Marketing--		
Transport to U.S. border	N.A.	1.31
Tariff[1]	N.A.	1.38
Other crossing fees	N.A.	.19
Selling cost	.25	.84
Total	7.70	9.62

N.A. = Not applicable.
[1] U.S. tariff rate equals the weighted average rate for the 1990/91 season. See table 54.

than for tomatoes and bell peppers. In contrast to the 77 percent in Mexico, miscellaneous and overhead, labor, and pesticides amounted to only 47 percent of preharvest costs in Florida.

The preharvest cost per box for Mexican cucumbers was $3.46 using an export yield of 553 bushels per acre, while Florida's cost was $3.04 with a slightly higher yield of 600 bushels per acre. Harvesting and packing costs were almost $2.00 less per bushel in Mexico than in Florida. A high transportation cost per bushel, U.S. duties, and selling fees accounted for a significantly higher marketing cost for Mexican cucumbers compared with all other commodities studied, both in Florida and in Mexico. The total marketing cost for Mexican cucumbers during the 1990/91 season was $3.72 compared with only $0.25 in Florida. The total cost of producing, packing, and marketing Mexican cucumbers in the 1990/91 season was $1.92 per bushel more than the total cost in Florida.

Eggplant

Florida controls the U.S. market for eggplant in the October to June season while Mexico dominates the winter season. The following sections discuss the production practices in Florida and Mexico and then compare the cost of production for the two areas.

Production Practices in Florida

Eggplants are produced in some area of Florida in every month of the year. The major harvest periods are November through May. Older cultivars include Florida Market and Florida Beauty. Most eggplants are produced from transplants on 36- to 60-inch bed centers and planted 30 to 48 inches apart. Most growers use plastic mulch, and some growers intercrop with cucumbers or squash. Soil fumigation before planting is important.

Optimum pH is 6.0 to 6.5, and fertilizer is usually applied according to soil test results not to exceed 90-120-120 N-P_2O_5-K_2O before planting and up to four sidedressings of 30-0-30. Irrigation is necessary in Florida. Insect pests include aphids, corn earworm and other caterpillars, potato beetles, flea beetles, spider mites, thrips, leaf miners, cutworms, and mole crickets. Diseases include phomopsis blight, fusarium root rot, and others. Weed control is simplified by the use of plastic mulch. Eggplants are hand-harvested and graded according to size.

Production Practices in Mexico

Eggplants are transplanted and then staked like tomatoes and peppers. The trend has been from oval- to tear-drop-shaped fruit with Classic and Epic as popular

cultivars. Some growers are packing in the field; others still pack in the shed. Eggplant are packed in bushel wirebound crates and cartons with 18 to 24 fruit per container. Harvest season extends from November to May.

Production Costs in Florida and Mexico

Mexico's demand for eggplants is small, and no adjustments were made to preharvest costs to accommodate for domestic sales. The principal preharvest cost categories for Mexican eggplant during 1990/91 were labor, miscellaneous and overhead, and pesticides (table 41). These three categories represent 65 percent of all preharvest costs. Florida's eggplant preharvest cost was considerably higher than Mexico's, with miscellaneous and overhead, pesticides, fertilizer, and land rent contributing to 72 percent of the total preharvest cost in Florida.

Table 41--Eggplant in Florida and Mexico, production and marketing costs, 1990/91

Item	Palm Beach County, Florida	Sinaloa, Mexico
	Dollars/acre	
Preharvest expenses:		
Land rent	600.00	155.57
Transplants	200.00	67.49
Fertilizer	716.75	292.65
Pesticides	864.02	329.14
Labor	1,174.98	831.57
Machinery	467.43	372.49
Miscellaneous and overhead	1,153.26	716.01
Interest	146.45	116.13
Total	5,322.89	2,881.05
	33-lb bushels/acre	
Yield	1,700	1,226
	Dollars/bushel	
Preharvest unit cost	3.13	2.35
Harvest and postharvest expenses:		
Harvest and haul	[1]	.38
Packing	1.92	1.62
Marketing--		
Transport to U.S. border	N.A.	.93
Tariff[2]	N.A.	.40
Other crossing fees	N.A.	.16
Selling cost	.50	.61
Total	5.55	6.45

N.A. = Not applicable.
[1] Included in packing.
[2] U.S. tariff rate equals the weighted average rate for the 1990/91 season. See table 54.

Per bushel, preharvest costs were $2.35 for Mexican eggplant, with an average export yield of 1,226 bushels per acre, and $3.13 for Florida eggplant, with an average yield of 1,700 bu'shels per acre. Harvesting and packing costs were about the same in the two production areas. Harvesting and packing costs are not much higher in Florida than in Mexico due to Florida's use of mobile packing sheds. Marketing costs were considerably higher in Mexico.

Squash

Export production of squash has nearly doubled in Mexico over the last 11 years while increasing 60 percent in Florida. The following sections discuss the production practices in Florida and Mexico and then compare the cost of production for the two areas.

Production Practices in Florida

Squash is produced in all areas of Florida except in the Everglades. Harvest is from early September to mid-July and year round for the local market. Current recommended yellow crookneck cultivars include Cracker, Dixie, Golden Rebel, Sundance, and Tara. Current recommended yellow straightneck cultivars include Goldbar, Lemondrop, Multipik, Seneca Butterbar, Seneca Prolifics, and Smoothie. Current recommended zucchini cultivars include Burpee Hybrid Zucchini, Elite Zucchini, Green Magic, Onyx, Senator, and Seneca Zucchini.

The stands are established by seed in rows 3-4 feet apart with 1-2 feet between bush-type plants. Vine-type plant rows are 5-9 feet apart with 3-5 feet between plants. Bees are needed at flowering for maximum yields and fruit quality. Plastic mulch is not necessary to maximize squash production in Florida; however, irrigation is necessary. On mineral soils (sandy), a basic application of 90-120-120 N-P_2O_5-K_2O and one to three supplemental applications of 30-0-30 are recommended with irrigated squash. Soil pH is normally adjusted to 6.0-6.5, and most fertilizer and lime requirements are based on a soil test.

Pests of squash include nematodes, pickleworm, melonworm, vine borer, whiteflies, leafminer, aphids, cucumber beetles, squash bugs, cutworms, mole crickets, wireworms, angular leaf spot, downy and powdery mildew, gummy stem blight, wet rot, and viruses. To adequately control weeds, growers use a

combination of cultural, mechanical, and chemical means.

All squash is harvested by hand. Summer squashes are ready to harvest as soon as the fruit reaches edible size. Pickers normally wear gloves to prevent damage to the tender fruit surfaces. U.S. grade standards for both summer and winter squash specify two grades: U.S. No. 1 and U.S. No. 2. To maximize shelf-life, summer squash is generally cooled to 40°F soon after harvest by hydrocooling or forced-air cooling. Summer squash will last 2 weeks at 40-42°F and 95-percent relative humidity. Winter squash will keep at temperatures of 50-55°F and relative humidity of 50-75 percent for 5-8 weeks.

Production Practices in Mexico

All types of squash are produced in Mexico including crookneck, straightneck, zucchini, and acorn. Popular cultivars for zucchini squash include Onyx, Raven, Ambassador, Chefini, Embassy, Napolini, and Lancer. The most common yellow crookneck cultivars include Dixie and Goldie. The more common yellow straightneck cultivars are Goldbar and Enterprise. Table Ace is the predominant acorn cultivar. Planting for squash generally begins October 20 for harvest November 20. The fruit are picked for over 2 months for each planting. Seeds are sown directly in the field in rows 5 feet apart. Yellow squash rows are spaced 40 inches apart. Growers use Monosem precision seeders and sow three seeds per meter. They irrigate after planting and do not use herbicides. Growers will use Treflan if weeds are too much of a problem. Weeding is generally done by hand.

Growers irrigate by furrow as necessary, especially at flowering and after the first picking. Sorghum is used as a trap crop for sucking insects and to reduce wind and dust damage. The crop is sprayed once a week or every 4 days for whitefly, although leafminer and aphids can be problems. Virus also can be a major problem. Bees are used and brought in at flowering at a rate of three hives per hectare.

Fertilization is determined by a soil test. The usual application is 400 kilograms per hectare of 30-30-30 together with 200 kilograms per hectare of urea, 50 kilograms per hectare of minor elements, and 20 kilograms per hectare of Furidan. Sidedress nitrogen is applied in the irrigation water from a tank.

Squash are picked by hand and packed close to the field. At peak production, two to three people are needed per hectare to harvest. Sizes are 1X (5-6"), 2X (6-7"), 3X (7-8"), and 4X (8-10"). About 1,200 boxes per hectare is considered a good yield. Harvest starts in November and finishes in March.

Production Costs in Florida and Mexico

Mexican squash producers grow various types of squash, zucchini primarily, but also yellow and scallop. Dade County, Florida, growers predominantly produce yellow straight and crookneck squash. Mexico's demand for squash is relatively minor and no adjustment to preharvest cost was done for domestic values. The main preharvest cost categories in Mexico for 1990/91 were fertilizer, pesticides, and machinery (table 42). These categories amounted to 58 percent of total preharvest costs. Preharvest labor costs were by far the lowest of any of the crops studied. At $51 per acre, squash was much lower than the next lowest crop of cucumbers at $582 per acre.

Table 42--Summer squash in Florida and Mexico, production and marketing costs, 1990/91

Item	Dade County, Florida	Sinaloa, Mexico
	Dollars/acre	
Preharvest expenses:		
Land rent	165.00	89.17
Transplants	150.00	71.98
Fertilizer	150.00	103.97
Pesticides	205.05	181.96
Labor	228.53	50.59
Machinery	275.97	136.19
Miscellaneous and overhead	131.64	68.93
Interest	48.85	19.68
Total	1,355.00	722.48
	42-lb bushels/acre	
Yield	275	209
	Dollars/bushel	
Preharvest unit cost	4.93	3.46
Harvest and postharvest expenses:		
Harvest and haul	1.82	1.71
Packing	2.25	3.11
Marketing--		
Transport to U.S. border	N.A.	.88
Tariff[1]	N.A.	.46
Other crossing fees	N.A.	.16
Selling cost	.50	1.30
Total	9.50	11.08

N.A. = Not applicable.
[1] U.S. tariff rate equals the weighted average rate for the 1990/91 season. See table 54.

Florida's preharvest costs were 68 percent higher than Mexico's preharvest costs. Major cost categories in Florida were machinery, pesticides, and labor, amounting to 52 percent of total preharvest costs.

Although preharvest costs for Mexican squash were almost $1.50 per bushel less than for Florida squash, the transportation and costs into the U.S. market gave Florida squash a total-cost edge of more than $1.50 per bushel.

Cost Changes in Florida and Mexico

The total cost of producing each of the five vegetables for the six seasons considered in this study are summarized in tables 43 and 44. Changes in the cost of producing each of the vegetables can be seen by comparing the costs from season to season.

Southwest Florida tomato producers lost their competitive position to Mexico between 1984/85 and 1990/91, while those in Dade County and west central Florida maintained the competitive position they held. Tomato growers in southwest Florida experienced a 22-percent increase in total costs, while the increase for Mexican producers was only 17 percent. Growers in Dade County and west central Florida experienced cost increases of 11 percent and 21 percent. Although west central Florida producers faced a higher increase in total costs, their total cost of production still remained lower.

Table 43--Production costs for growing, harvesting, and marketing fresh winter tomatoes, peppers, cucumbers, eggplant, and squash, Florida[1]

Commodity and cost item	1967/68[2]	1970/71[2]	1973/74[2]	1978/79[3]	1984/85[4]	1990/91
			Dollars/25-lb equivalent			
Tomatoes:						
Dade County mature green--						
Preharvest	0.78	0.88	2.16	2.35	2.61	3.00
Harvest, pack, sell	.85	1.17	1.83	2.43	3.17	3.40
Total	1.63	2.05	3.99	4.78	5.78	6.40
Southwest Florida mature green--						
Preharvest	n.a.	n.a.	2.21	2.38	2.90	3.65
Harvest, pack, sell	n.a.	n.a.	1.96	2.28	3.05	3.60
Total	n.a.	n.a.	4.17	4.66	5.95	7.25
West central Florida mature green--						
Preharvest	n.a.	n.a.	n.a.	1.88	2.14	3.11
Harvest, pack, sell	n.a.	n.a.	n.a.	2.23	2.93	3.07
Total	n.a.	n.a.	n.a.	4.11	5.07	6.18
			Dollars/bushel			
Bell peppers:						
Preharvest	.95	1.01	2.16	2.98	3.28	4.92
Harvest, pack, sell	1.69	2.11	2.21	2.83	2.68	3.68
Total	2.64	3.12	4.37	5.81	6.49	8.40
Cucumbers:						
Preharvest	.82	.89	2.68	3.53	4.69	3.04
Harvest, pack, sell	1.99	2.48	2.66	3.38	4.12	4.60
Total	2.81	3.37	5.34	6.91	8.81	7.70
Eggplants:						
Preharvest	.77	.80	1.87	2.76	1.56	3.13
Harvest, pack, sell	1.18	1.58	1.33	1.84	1.91	2.42
Total	1.95	2.38	3.20	4.60	3.47	5.55
Squash:						
Preharvest	n.a.	n.a.	n.a.	n.a.	3.55	4.93
Harvest, pack, sell	n.a.	n.a.	n.a.	n.a.	4.45	4.57
Total	n.a.	n.a.	n.a.	n.a.	8.00	9.50

n.a. = Not available.

[1] F.o.b. the packinghouse.

[2] Production costs from Fliginger, Garett, Podany, and Powell, 1969; Simmons, Pearson, and Smith, 1976.

[3] Productions costs from Zepp and Simmons, 1979.

[4] Production costs from Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez, 1986.

Table 44--Production costs for growing, harvesting, and marketing fresh winter tomatoes, peppers, cucumbers, eggplant, and squash, Mexico[1]

Commodity and cost item	1967/68[2]	1970/71[2]	1973/74[2]	1978/79[3]	1984/85[4]	1990/91
			Dollars/25-lb equivalent			
Tomatoes:						
Mexico vine-ripened--						
Preharvest	0.38	0.40	0.78	1.04	1.78	2.86
Harvest, pack, sell	.78	.83	1.45	2.12	2.07	2.37
Export costs	1.28	1.30	1.53	1.63	2.28	1.94
Total	2.44	2.53	3.76	4.79	6.13	7.16
			Dollars/bushel			
Bell peppers:						
Preharvest	1.30	.74	.94	1.79	1.95	3.99
Harvest, pack, sell	1.19	1.22	1.45	2.10	2.11	1.93
Export costs	1.79	1.80	1.62	2.61	3.74	2.42
Total	4.28	3.76	4.01	6.50	7.80	8.15
Cucumbers:						
Preharvest	1.06	.87	1.58	1.99	1.66	3.46
Harvest, pack, sell	1.28	1.30	1.67	2.08	2.26	2.42
Export costs	2.67	2.70	2.87	3.30	4.62	3.73
Total	5.01	4.87	6.12	7.37	8.54	9.62
Eggplants:						
Preharvest	.31	.33	.72	1.23	1.19	2.35
Harvest, pack, sell	.96	.98	1.10	1.67	1.86	2.00
Export costs	1.03	1.07	1.58	1.95	2.45	2.10
Total	2.30	2.38	3.40	4.85	5.50	6.45
Squash:						
Preharvest	n.a.	n.a.	n.a.	n.a.	2.81	3.46
Harvest, pack, sell	n.a.	n.a.	n.a.	n.a.	2.86	4.82
Export costs	n.a.	n.a.	n.a.	n.a.	2.60	2.80
Total	n.a.	n.a.	n.a.	n.a.	8.27	11.08

n.a. = Not available.
[1] F.o.b. the packinghouse.
[2] Production costs from Fliginger, Garett, Podany, and Powell, 1969; Simmons, Pearson, and Smith, 1976.
[3] Productions costs from Zepp and Simmons, 1979.
[4] Production costs from Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez, 1986.

Bell pepper producers in Florida lost their cost competitive advantage to Mexico in the 1990/91 season. Costs increased for Florida's growers by 29 percent during 1984/85-1990/91, compared with only 4 percent for Mexico's growers. The higher costs in Florida and relatively stable costs in Mexico gave Mexican growers a cost advantage for the first time since 1973/74.

Cucumber producers in Florida regained their cost of production advantage as their total costs declined 13 percent compared with a 20-percent increase for Mexico's growers. Costs declined in Florida primarily because most cucumber producers began to grow cucumbers as a second crop to tomatoes, spreading many preharvest costs over the two crops. That change returns the cost competitive advantage to Florida as it had always been prior to the 1984/85 season.

Although Florida maintained a cost of production advantage in eggplant, that advantage decreased as total costs in Florida increased by 57 percent com-

pared with only 17 percent in Mexico. Florida producers improved their cost advantage in squash as Florida experienced an increase of only 19 percent compared with an increase of 34 percent for Mexico.

The average cost of production across all crops increased by 18 percent in Mexico and 21 percent in Florida over the 1984/85 production season. However, preharvest costs in Mexico increased by an average of 120 percent, while average preharvest costs in Florida increased by only 56 percent. Fertilizer costs increased the most in Mexico, by an average 177 percent across all crops. This increase is mostly due to the deregulation of the fertilizer industry in Mexico. By contrast, fertilizer costs in Florida increased only an average 20 percent.

Labor also increased more in Mexico than in Florida. Average labor costs in Mexico increased 117 percent compared with 69 percent in Florida. Although average daily wage rates in Mexico have actually declined in Mexico (table 32), the average preharvest cost of labor more than doubled. Most growers attribute this increase to decreased labor productivity in Mexico.

Machinery costs increased significantly in both areas, but more so in Mexico where average preharvest machinery costs increased 119 percent. These costs increased largely because of growers shifting to production practices that substitute machinery for labor where practical and efficient.

Pesticide costs increased significantly in both areas, an average of 93 percent in Mexico and 88 percent in Florida. Both areas had increased problems of pests and viruses to deal with during 1984/85-1990/91.

Miscellaneous costs also increased significantly in both areas, an average of 151 percent in Mexico and 101 percent in Florida. Higher costs in Florida have been attributed to the passing of more regulations affecting growers. Higher costs in Mexico are due to more regulations but also to increases in management needed for personnel services, such as satisfying new laws that did not exist in 1984/85 on income taxes.

Overall preharvest costs increased an average of 120 percent in Mexico compared with only 56 percent in Florida. Harvesting, packing, and marketing costs offset some of this gained advantage for Florida as these costs increased by an average of 12 percent in Florida and decreased in Mexico by 1 percent. Mexican producers' costs for transportation to the U.S. border and for selling all crops but squash decreased.

Costs Delivered to Terminal Markets

In 1990/91, Florida had a decided advantage in the production and marketing of cucumbers, eggplant, squash, and tomatoes in Dade County and tomatoes in west central Florida, but Mexico had a cost of production advantage for bell peppers and for tomatoes compared with those grown in southwest Florida. Cost competitive positions may be analyzed by comparing costs delivered to selected U.S. major markets.

We added transportation costs to Florida and Mexico production and marketing costs to derive comparable cost estimates for each of the five vegetables delivered to Chicago and New York City terminal markets (tables 45 and 46). The cost of transportation during the winter production season rose 13 percent from $1.15 per mile in 1985 to $1.30 per mile in 1991. Transportation rates from Florida to New York City were 45 percent lower than those from Nogales, Arizona. Transportation from Florida to Chicago was 5 percent lower than from Arizona.

Florida retained its cost advantage in delivering to the New York City market in 1990/91, generally presumed to be Florida's best wholesale market for fresh produce. Florida also retained an advantage in Chicago for all crops. The results are consistent with those of 1984/85 when Florida held the advantage for all crops.

The advantage Florida held in cucumbers and squash strengthened from 1984/85 to 1990/91 in both Chicago and New York City. Mexico reduced the advantage held by Florida for bell peppers and eggplant since 1984/85. Florida's advantage has continued to deteriorate since 1978/79 for tomatoes from southwest Florida while it continued to increase for tomatoes from the Dade County and Palmetto-Ruskin production areas. Florida's loss of advantage in bell peppers is a reversal of a trend that had existed since 1973/74, when Mexico last held an advantage in that crop.

Net Competitive Position

While growers in one area may pay more to grow and market a crop, offsetting higher revenues could make that area more competitive in the marketplace. Analyses of competitive position must include assessing the revenues received by growers in each area. We analyzed revenues to determine the price advantage for each of the five crops. The sum of price advantage and cost advantage allows us to assess the overall competitive advantage.

Table 45—Total costs of production, marketing, and delivery to Chicago for fresh winter vegetables

Crop/producing area	1967/68[1]	1970/71[1]	1973/74[2]	1978/79[2]	1984/85[3]	1990/91[4]
			Dollars/25-lb equivalent			
Tomatoes:						
Florida mature green--						
Southwest	n.a.	n.a.	5.03	5.68	6.93	8.28
Dade County	n.a.	n.a.	4.85	5.81	6.83	7.50
Palmetto-Ruskin	n.a.	n.a.	n.a.	5.14	5.97	7.10
Mexico vine-ripened	3.20	3.37	4.77	6.18	7.26	8.56
Difference[5]--						
Southwest	n.a.	n.a.	.26	.50	.33	.28
Dade County	n.a.	n.a.	.08	.37	.43	1.06
Palmetto-Ruskin	n.a.	n.a.	n.a.	1.04	1.29	1.46
			Dollars/bushel			
Bell peppers:						
Florida	3.54	4.12	5.67	7.21	7.37	9.53[6]
Mexico	5.34	5.02	5.15	8.30	9.18	9.69
Difference[5]	1.80	.90	1.09	.52	1.81	.16
Cucumbers:						
Florida	3.96	4.67	7.09	8.87	11.15	9.77
Mexico	6.32	6.34	7.86	10.02	11.66	12.41
Difference[5]	2.36	1.67	.77	1.15	.51	2.64
Eggplant:						
Florida	2.90	3.43	4.55	6.05	4.91	6.81
Mexico	3.41	3.67	4.59	6.70	7.37	8.17
Difference[5]	.51	.24	.04	.65	2.46	1.36
Squash:						
Florida	n.a.	n.a.	n.a.	n.a.	9.97	11.36
Mexico	n.a.	n.a.	n.a.	n.a.	10.72	13.43
Difference[5]	n.a.	n.a.	n.a.	n.a.	.75	2.07

n.a. = Not available.

[1] Costs for 1967/68 and 1970/71 are from Fliginger, Garett, Podany, and Powell, 1971.

[2] Costs for 1973/74 and 1978/79 are from Zepp and Simmons, 1979.

[3] Costs for 1984/85 are from Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez, 1986.

[4] Transportation costs based on the January through May 1991 average in monthly truck rates for owner-operators collected by the Agricultural Marketing Service, USDA.

[5] Difference between Mexico and Florida costs. A positive number indicates a cost advantage for Florida.

[6] Simple average of Palm Beach County costs and Southwest Florida costs.

Table 46--Total costs of production, marketing, and delivery to New York City for fresh winter vegetables

Crop/producing area	1967/68[1]	1970/71[1]	1973/74[2]	1978/79[2]	1984/85[3]	1990/91[4]
			Dollars/25-lb equivalent			
Tomatoes:						
Florida mature green--						
Southwest	n.a.	n.a.	5.03	5.68	6.94	8.28
Dade County	n.a.	n.a.	4.85	5.81	6.82	7.47
Palmetto-Ruskin	n.a.	n.a.	n.a.	5.14	5.99	7.10
Mexico vine-ripened	3.60	3.94	5.22	6.18	7.97	9.14
Difference[5]--						
Southwest	n.a.	n.a.	.19	.50	1.03	.86
Dade County	n.a.	n.a.	.37	.37	1.15	1.67
Palmetto-Ruskin	n.a.	n.a.	n.a.	1.04	1.98	2.04
			Dollars/bushel			
Bell peppers:						
Florida	3.44	4.02	5.57	7.21	7.37	9.54[6]
Mexico	5.90	5.89	5.63	8.30	9.74	10.34
Difference[5]	2.46	1.87	.06	.52	2.37	.80
Cucumbers:						
Florida	3.91	4.57	6.99	8.87	11.16	9.77
Mexico	7.01	7.37	8.64	10.02	12.92	13.59
Difference[5]	3.10	2.80	1.65	1.15	1.76	3.82
Eggplant:						
Florida	2.80	3.33	4.45	6.05	4.89	6.77
Mexico	3.99	4.57	5.07	6.70	8.13	8.89
Difference[5]	1.19	1.24	.62	.65	3.24	2.12
Squash:						
Florida	n.a.	n.a.	n.a.	n.a.	9.95	11.30
Mexico	n.a.	n.a.	n.a.	n.a.	11.70	14.42
Difference[5]	n.a.	n.a.	n.a.	n.a.	1.77	3.12

n.a. = Not available.

[1] Costs for 1967/68 and 1970/71 are from Fliginger, Garett, Podany, and Powell, 1971.

[2] Costs for 1973/74 and 1978/79 are from Zepp and Simmons, 1979.

[3] Costs for 1984/85 are from Buckley, VanSickle, Bredahl, Belibasis, and Gutierrez, 1986.

[4] Transportation costs based on the January through May 1991 average in monthly truck rates for owner-operators collected by the Agricultural Marketing Service, USDA.

[5] Difference between Mexico and Florida costs. A positive number indicates a cost advantage for Florida.

[6] Simple average of Palm Beach County costs and Southwest Florida costs.

Revenue Analysis

We calculated simple, common, and weighted average prices received f.o.b. at the packinghouse in Florida and at the distributors' shed in Nogales, Arizona, for the five vegetables (tables 47 to 52). Simple average prices represent the weekly average price of the commodity over the season of the crop for each area. Common average prices represent the average prices received during weeks in which both areas had prices quoted by market news sources. Thus, differences in common average prices represent the differences in prices charged for similar commodities. These differences may be due to quality or to competition in the marketplace. Weighted average prices account for the effect of volume on the season average price.

During any given week, Florida packers received from $3.07 to $4.70 per carton more for tomatoes than Mexican distributors in Nogales, Arizona, as shown in the common average prices. When the severe freeze years in Florida in 1984/85 and 1989/90 are removed from the data, the difference decreases only slightly to $2.91 for comparison with Mexico's mature green tomato season. The difference remains virtually the same for Mexico's vine-ripened tomato season at $4.71. Mexican distributors are clearly receiving substantially less than Florida packers for tomatoes sold in the U.S. market. Simple average prices show Florida's advantage to be $2.58 over Mexican vine-ripened tomatoes and for growers in both areas to receive equal simple average prices of $10.88 when comparing Florida prices with Mexican mature green tomatoes. Removing the severe freeze years of 1984/85 and 1989/90 gives Florida an advantage of $4.53 over Mexican vine-ripened tomatoes and $2.75 over Mexican mature green tomatoes.

Weighted average prices indicate that Mexico was able to offset part of Florida's revenues advantage by shipping more tomatoes in periods of higher prices. Mexico held an advantage of $0.57 over Florida during 1984/85-90/91. When the severe freeze years of 1984/85 and 1989/90 are not included, however, Florida regains the weighted average price advantage, equaling $2.38 per carton.

The same advantages in average prices can be seen in the other winter vegetables. Common average prices are higher in Florida for all other crops, whereas Mexico holds an advantage in weighted average prices for all other crops except cucumbers. Mexico and Florida are almost equal in weighted average prices for cucumbers, with Florida receiving $12.66 and Mexico receiving $12.64 per carton.

The benefit Mexico received from Florida's erratic weather is evident when prices for 1984/85 and 1989/90, years of severe freezes, are removed. When those two seasons are removed from the data, Florida regains a weighted average price advantage for all crops except squash. This shift generally occurs because Mexico capitalizes on exceptionally high markets when Florida experiences a severe freeze. For example, Mexico received a weighted average price of $21.49 per carton for tomatoes in 1989/90 compared with $5.67 per carton in Florida. In contrast, Florida generally does not have much produce to sell in these high markets because of the crop damage. Instead, Florida growers usually replant and a large amount of product comes to market late in the season, depressing prices for much of Florida's crop in these freeze seasons. However, Dade County is sometimes spared the effects of freeze damage. Dade County escaped severe damage in 1984/85 and was able to sell tomatoes for higher weighted average prices of $9.15. In contrast, Dade County also lost crop in 1989/90 and received a weighted average price of $4.98 for tomatoes.

Florida held a cost advantage for producing cucumbers, eggplant, squash, and tomatoes in Dade County and in the spring market for tomatoes grown in west central Florida for 1990/91. Mexico held a cost advantage in bell peppers and tomatoes compared with production in southwest Florida. We computed price advantage using weighted average prices because this measure includes consideration of volume. Mexico held a price advantage for all crops, except for cucumbers and for tomatoes, compared with production in west central Florida.

Net competitive position is calculated as the sum of pricing and cost advantages. Table 53 shows the net competitive position of Florida producers relative to Mexico. A positive number indicates Florida has an advantage, while a negative number indicates an advantage for Mexican producers. The results show that Florida held a net competitive advantage for cucumbers, eggplant, and squash and for tomatoes grown in Dade County, Florida. Mexico held a competitive advantage for bell peppers and for tomatoes compared with southwest and west central Florida.

Compared with 1984/85, Florida's net competitive position in 1990/91 improved for tomatoes, bell peppers, cucumbers, and squash, but decreased for eggplant. The primary reason for the improvement in tomatoes was an increase in the price advantage for Florida producers. Price advantage also improved for Florida bell pepper growers, while cost advantage decreased. However, the gain in price advantage

Table 47—Tomatoes: Simple and common average prices received by Florida and Mexico growers

Season	Simple average			Common average			
		Mexico		Florida		Mexico	
	All Florida	Vine-ripened	Mature green	Vine-ripened[1]	Mature green[2]	Vine ripened[1]	Mature green[2]
	25-lb equivalents						
1973/74-77/78	6.53	6.28[3]	n.a.	n.a.	n.a.	n.a.	n.a.
1978/79-83/84	7.53	7.40[3]	n.a.	n.a.	n.a.	n.a.	n.a.
1984/85	9.65	7.91	13.21	13.03	17.14	8.01	13.21
1985/86	10.59	5.39	7.00	10.44	10.50	5.43	7.00
1986/87	9.50	4.93	6.80	9.07	9.00	4.93	6.80
1987/88	9.12	5.77	6.60	9.52	8.73	5.77	6.60
1988/89	10.84	8.11	9.29	12.81	13.00	8.11	9.29
1989/90	13.31	19.69	23.55	21.85	24.61	17.44	21.56
1990/91	13.12	6.28	9.71	12.20	12.70	6.28	9.71
1984/85-90/91	10.88	8.30	10.88	12.70	13.67	8.00	10.60
Less 1984/85 and 1989/90	10.63	6.10	7.88	10.81	10.79	6.10	7.88

n.a. = Not available.

[1] Average price of all tomatoes in Florida and vine-ripened tomatoes in Mexico using only those weeks in which Florida quotes a price and Mexico quotes a price for vine-ripened tomatoes.

[2] Average price of all tomatoes in Florida and mature-green tomatoes in Mexico using only those weeks in which Florida quotes a price and Mexico quotes a price for mature-green tomatoes.

[3] Includes all tomatoes.

Source: Florida Tomato Committee, various issues; U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 48—Tomatoes: Weighted average prices received by growers

Season	Florida				Mexico
	Dade County	Southwest	West central[1]	Statewide[2]	
	Dollars/25-lb equivalent				
1973/74-77/78	n.a.	n.a.	n.a.	6.08	5.94
1978/79-83/84	7.00	6.02	5.65	6.22	7.14
1984/85	9.15	5.95	3.40	6.17	8.58
1985/86	7.77	8.35	6.30	7.47	5.37
1986/87	7.02	6.93	7.35	7.10	4.64
1987/88	7.46	7.16	5.82	6.81	5.40
1988/89	9.86	8.99	10.44	9.76	7.67
1989/90	4.98	7.03	5.00	5.67	21.49
1990/91	9.25	8.35	13.77	10.46	6.55
1984/85-90/91	8.93	7.54	7.44	7.97	8.54
Less 1984/85 and 1989/90	8.27	7.96	8.74	8.32	5.94

n.a. = Not available.

[1] The west central Florida spring season is considered to begin the first full week in which March 17 fell and ended with the last recorded shipments.

[2] Simple average of Dade County, Southwest Florida, and west central Florida.

Source: Florida Tomato Committee, various issues; U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 49--Cucumbers: Simple, common, and weighted average prices received by growers

Crop year	Simple		Common		Weighted	
	Florida	Mexico	Florida	Mexico	Florida	Mexico
	Dollars/bushel					
1973/74-77/78	10.44	10.34	n.a.	n.a.	8.81	10.13
1978/79-83/84	12.93	12.43	n.a.	n.a.	11.83	12.23
1984/85	12.71	12.50	13.11	12.89	11.37	12.30
1985/86	12.00	10.27	13.33	10.07	11.06	10.26
1986/87	12.52	13.97	12.14	11.89	13.81	14.15
1987/88	13.77	10.11	13.60	11.65	13.10	9.68
1988/89	15.43	15.71	14.36	13.82	15.23	15.58
1989/90	12.60	12.31	8.40	7.33	11.88	12.25
1990/91	15.12	14.88	12.41	10.93	12.14	14.24
1984/85-90/91	13.45	12.86	12.48	11.31	12.66	12.64
Less 1984/85 and 1989/90	13.77	13.05	13.17	11.79	13.07	12.78

n.a. = Not available.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 50--Eggplant: Simple, common, and weighted average prices received by growers

Crop year	Simple		Common		Weighted	
	Florida	Mexico	Florida	Mexico	Florida	Mexico
	Dollars/bushel					
1973/74-77/78	n.a.	n.a.	n.a.	n.a.	3.15	4.35
1978/79-83/84	6.70	5.30	n.a.	n.a.	5.74	5.53
1984/85	4.83	6.64	4.85	4.09	4.57	6.94
1985/86	4.87	4.28	4.77	3.69	4.88	4.51
1986/87	6.61	5.64	6.43	5.64	5.95	5.97
1987/88	8.86	6.57	8.86	6.73	7.71	6.33
1988/89	6.17	5.00	6.17	5.00	6.10	5.06
1989/90	14.30	15.69	17.07	15.55	8.71	16.06
1990/91	9.15	6.86	9.36	6.86	8.63	6.96
1984/85-90/91	7.03	7.24	8.22	6.79	6.65	7.48
Less 1984/85 and 1989/90	7.13	5.67	7.12	5.58	6.65	5.87

n.a. = Not available.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 51--Bell pepper: Simple, common, and weighted average prices received by growers

Crop year	Simple		Common		Weighted	
	Florida	Mexico	Florida	Mexico	Florida	Mexico
			Dollars/bushel			
1973/74-77/78	8.86	10.32	n.a.	n.a.	7.42	10.09
1978/79-83/84	11.43	13.59	n.a.	n.a.	10.19	13.66
1984/85	9.19	13.57	10.39	13.39	8.32	14.37
1985/86	10.10	9.33	9.70	9.33	10.43	9.19
1986/87	8.97	8.68	8.75	8.47	9.19	8.14
1987/88	7.73	6.67	7.17	6.67	8.18	6.89
1988/89	7.70	6.98	7.70	6.98	7.79	6.76
1989/90	15.93	16.82	20.61	16.82	9.43	18.41
1990/91	11.39	10.84	10.94	10.84	11.74	10.28
1984/85-90/91	10.14	10.41	10.75	10.36	9.30	10.58
Less 1984/85 and 1989/90	9.18	8.50	8.85	8.46	9.46	8.25

n.a. = Not available.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 52--Squash: Simple, common, and weighted average prices received by growers

Crop year	Simple		Common		Weighted	
	Florida	Mexico	Florida	Mexico	Florida	Mexico
			Dollars/bushel			
1973/74-77/78	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1978/79-83/84	11.78	14.90	n.a.	n.a.	10.90	14.71
1984/85	9.16	5.65	7.53	5.61	8.11	5.81
1985/86	12.67	10.67	12.97	10.97	13.09	10.09
1986/87	9.64	10.19	9.72	10.19	8.97	10.72
1987/88	7.38	7.04	7.35	7.04	7.11	7.53
1988/89	9.45	10.00	9.45	10.00	8.65	10.16
1989/90	7.29	8.50	7.67	8.57	6.40	8.08
1990/91	10.13	10.50	10.61	10.50	9.48	10.13
1984/85-90/91	9.39	8.94	9.33	8.98	8.83	8.93
Less 1984/85 and 1989/90	9.85	9.68	10.02	9.74	9.46	9.72

n.a. = Not available.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, *Marketing Florida Vegetables* and *Marketing West Mexico Fruits and Vegetables*, various issues.

Table 53–Net competitive advantage for Florida in supplying winter fresh vegetables to U.S. markets, 1990/91

Commodity/ area	Price advantage	Cost advantage	Net advantage
	Dollars/package		
Tomatoes			
Dade County, FL	0.39	0.76	1.15
Southwest, FL	-1.00	-.09	-1.09
West central, FL	-1.10	.98	-.12
Bell peppers	-1.28	-.25	-1.54
Cucumbers	.02	1.92	1.94
Eggplant	-.83	.90	.07
Squash	-.10	1.58	1.48

more than offset the decrease in cost advantage as net competitive advantage increased by $0.62 per bushel. Florida's net competitive advantage in cucumbers and squash increased because of increases in both cost and pricing advantage. Decreases in both cost and pricing advantage lead to an overall decrease in net competitive advantage for Florida eggplant producers.

Impact of Tariff Removal under NAFTA

The North American Free Trade Agreement (NAFTA) between the United States, Canada, and Mexico was signed into law by President Clinton on December 7, 1993. Under the NAFTA, all tariff and nontariff barriers on agricultural products will be eliminated for trade between the United States and Mexico.

Several provisions in NAFTA will impact the competitiveness of winter fresh vegetables produced in Florida and Mexico. Explicit trade barriers such as tariffs and quotas are one such policy change that will have a direct effect on competitiveness. Many other factors may have a greater impact on trade in the medium and long run. These include technical change created by investments in research and technology, weather, disease problems, national macroeconomic conditions, price policies, environmental and water use policies, transportation, labor policy, and shifts in consumer tastes. The change in the investment climate alone as proposed and recently implemented by the Mexican Government will have significant impacts on the long-run competitiveness of Mexican winter fresh vegetables, as well as other crops and enterprises.

Table 54–Actual and weighted average tariffs for winter fresh vegetables from Mexico imported into the United States, 1990/91

Item	Tariff	
	Cents/kg	*Cents/25-lb equivalent*
Tomatoes:		
March 1-July 14 and September 1-November 1	4.5	52.5
July 15-August 21	3.3	37.4
November 15-February 28	3.3	37.4
Weighted average	N.A.	46.4
		Cents/bushel
Bell pepper, all year	5.5	69.9
Cucumbers:		
December 1-February 28	4.9	122.5
March 1-April 30	6.6	164.7
May 1-June 30 and September 1-November 30	6.6	164.7
July 1-August 31	3.3	82.4
Weighted average	N.A.	138.8
Eggplant:		
April 1-November 30	3.3	49.4
December 1-March 30	2.4	36.0
Weighted average	N.A.	40.0
Squash, all year	2.4	45.7

N.A. = Not applicable.
Source: Cottrell and Lucier, 1991.

The NAFTA provides for the eventual removal of tariffs between the two countries (table 54). Tariffs are generally a small part of the total unit cost of production and marketing for these crops, ranging from 4 percent for squash to 14 percent for cucumbers (table 55). While the contribution of the tariff to total cost may seem small in relative terms for some crops, they add up to significant absolute costs per acre for Mexican winter fresh vegetables, ranging from $96 per acre for squash to $769 per acre for cucumbers (table 55). Removing tariffs would improve Mexican growers' net competitive position for all the vegetables included in this study (table 56). The savings in cost on both a relative and absolute basis will change how growers and investors view winter fresh vegetables grown in Mexico.

Changes in net competitive advantage are correlated with changes in market shares. From 1984/85, net

Table 55–Average U.S. tariff contribution to the costs for Mexican vegetables

Vegetables	Average tariff	Tariff as percent of cost	Cost of tariff
	Dollars/ carton	*Percent*	*Dollars/ acre*
Tomatoes	0.46	6.4	404.80
Bell peppers	.70	8.6	529.20
Cucumbers	1.39	14.4	768.67
Eggplant	.40	6.2	490.40
Squash	.46	4.2	96.14

Table 56–Current Florida net competitive advantage, U.S. tariff, and competitive advantage without tariff, 1990/91

Commodity/ area	Net advantage	U.S. tariff	Net advantage without tariff
		Dollars/package	
Tomatoes			
Dade County	1.15	0.46	0.69
Southwest Florida	-1.09	.46	-1.55
West central Florida	-.12	.46	-.58
Bell peppers	-1.54	.70	-2.24
Cucumbers	1.94	1.39	.55
Eggplant	.07	.40	-.33
Squash	1.48	.46	1.02

competitive advantage for all Florida tomatoes improved by $0.87 per carton and market share increased by 8.66 percent. For cucumbers, net competitive advantage improved by $2.61 and market share increased by 3.53 percent. Net competitive advantage for Florida eggplant declined by $2.17 and market share dropped by 9.95 percent.

Although changes in market share cannot be directly tied to changes in net competitive advantage, changes in costs and revenues received will affect the market shares controlled by various market participants. Removal of tariffs will improve returns to Mexican producers. These changes and the change in the investment climate should help Mexico improve its competitive situation over the next several years.

Conclusions

Results of the analyses conducted in this research have shown that Florida and Mexico are major competitors in the winter fresh vegetable market. Florida gained in net competitive advantage over the 6 years for tomatoes, bell peppers, cucumbers, and squash. Florida lost in net competitive advantage for eggplant.

Comparing changes in market shares with changes in net competitive advantage shows that market shares generally have changed in the same direction as changes in net competitive position. Net competitive position improved for Florida tomatoes in all producing areas by an average of $0.86 per carton, and market share improved 8.66 percent over the same period in the winter market. Florida's net competitive advantage improved $2.61 per bushel for cucumbers and market share improved 3.53 percent in the October to June market. Florida improved its cost advantage in cucumbers primarily because cucumbers are now grown as a second crop to tomatoes in southwest Florida.

Eggplant showed the greatest loss for Florida. Florida's net competitive advantage decreased $2.17 per bushel from 1984/85 to 1990/91, and market share decreased 9.95 percent over the same period in the October to June market and 4.7 percent in the winter market. Florida lost $1.13 per bushel in cost advantage and $1.04 per bushel in pricing advantage.

Squash showed the only contrasting changes in net competitive advantage and market share. While improving its net competitive advantage by $5.02 per bushel (mostly from an improvement of $3.71 in pricing advantage), Florida lost 4.86 percent in market share in the October to June market and 4.35 percent in market share in the winter market.

While Florida bell pepper growers gained $0.62 per bushel in net competitive advantage during our study years, they lost 0.38 percent in market share over the same period in the October to June market, and gained 12.23 percent in the winter market.

The North American Free Trade Agreement involves many facets of trade, including the eventual removal of tariffs between the two countries. Tariffs are generally a small part of total costs, around 4-8 percent, except for cucumbers. Tariffs appear especially significant in table 55 because they are compared with the margin, which is small for all products. The importance of the tariffs to the net competitive advantage varies from season-to-season because they are specific, while the cost of production and value of the crop change each season. One year of data is therefore only a snapshot

and can only be important when referenced to the study year.

Removal of tariffs will improve the returns to Mexican producers. These changes and a change in the investment climate should help Mexico improve its competitive situation over the next several years.

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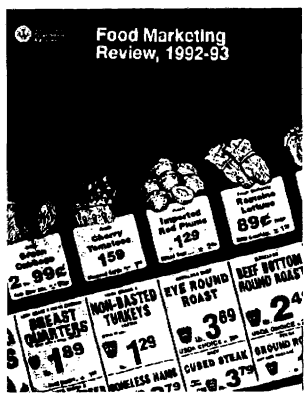

Retail sales of the food marketing system reached a projected $820 billion in 1993, an increase of nearly 5 percent from the previous year. Food share of disposable income fell to an all-time low of 11.4 percent.

Other highlights of the new ERS report include:

* The food system added an estimated $614 billion in value to the $126 billion of U.S. farm products, $22 billion in foreign processed food commodities, and $9 billion in seafood products purchased in 1992.

Both food processors' and retailers' level of profit from operations rose in 1992, but returns on stockholders' equity fell. Food processors' profits rose again in 1993.

* Merger and leveraged buyout activity rose in 1992, following 3 years of sharp declines. Recorded mergers and leveraged buyouts (LBO's) amounted to $3 billion in 1991 and $5.7 billion in 1992.

* Debt levels rose in 1992 for food processors and retailers.

* Common stock prices of food marketing firms underperformed other sectors of the economy for the first time in a decade in 1992 and kept falling in 1993.

* On the cost side, wages rose modestly in 1992 and 1993. Manufacturers' purchase prices of farm foods fell slightly in both 1992 and 1993.

* Food manufacturers produced an estimated 230,000 packaged food products in 1991. Average retail food prices in grocery stores rose 0.7 percent in 1992.

* Manufacturers spent nearly $11 billion in consumer advertising and fiercely competed for a greater share of the limited amount of retail shelf space in 1991. Despite the continued economic slowdown, nearly 16,750 new grocery products were introduced in 1992.

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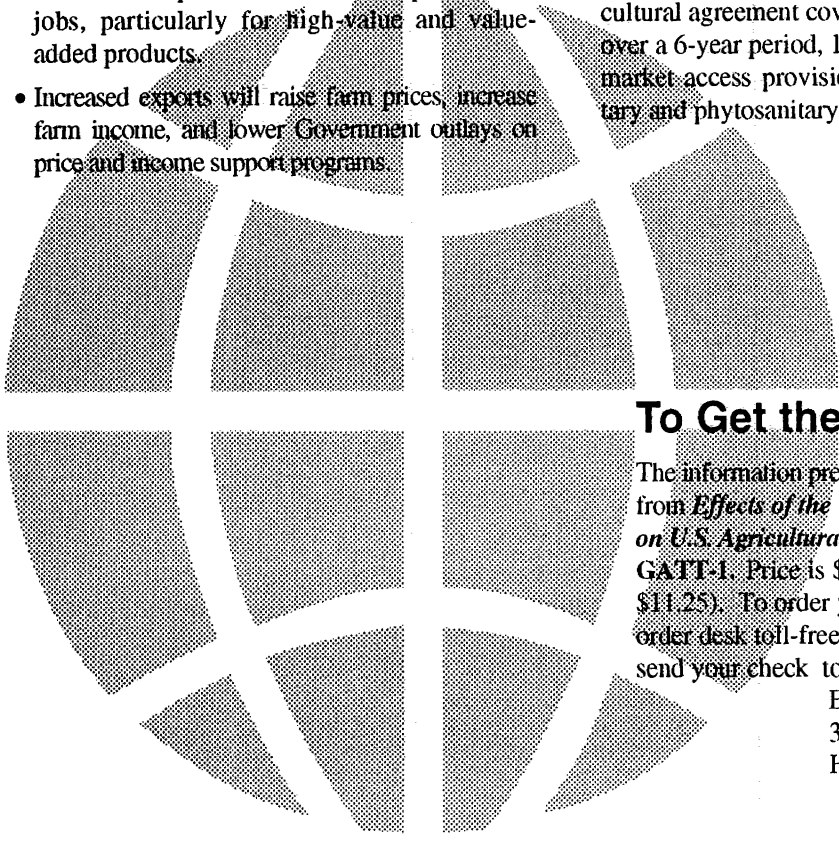
On December 15, 1993, the United States reached an historic agreement concluding the Uruguay Round of Multilateral Trade Negotiations under the auspices of the General Agreement on Tariffs and Trade (GATT). Benefits arising from the agreement include:

- U.S. farmers will gain from the increase in world income that will arise from the Uruguay Round agreement.
- U.S. agricultural exports are expected to increase by between $1.6 billion and $4.7 billion in 2000 and between $4.7 billion and $8.7 billion in 2005.
- Increased exports mean more export-related jobs, particularly for high-value and value-added products.
- Increased exports will raise farm prices, increase farm income, and lower Government outlays on price and income support programs.
- Perhaps even more important for the *future* is the discipline the Uruguay Round will apply to countries that might otherwise choose closed markets, production-inducing internal supports, and subsidized exports. This agreement has important consequences for our large trading partners that are currently outside the GATT: China, Taiwan, and the nations of the former Soviet Union.

Provisions of the Agreement

The Uruguay Round (UR) Agreement is an historic effort to open world agricultural markets, prompting increased trade and dynamic growth. The agricultural agreement covers four areas implemented over a 6-year period, 1995-2000, export subsidies, market access provisions, internal supports, sanitary and phytosanitary measures.



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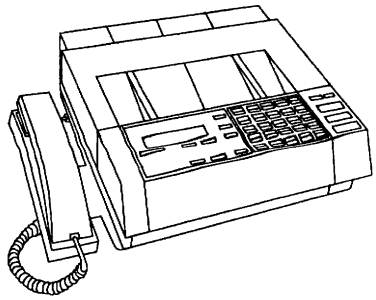

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